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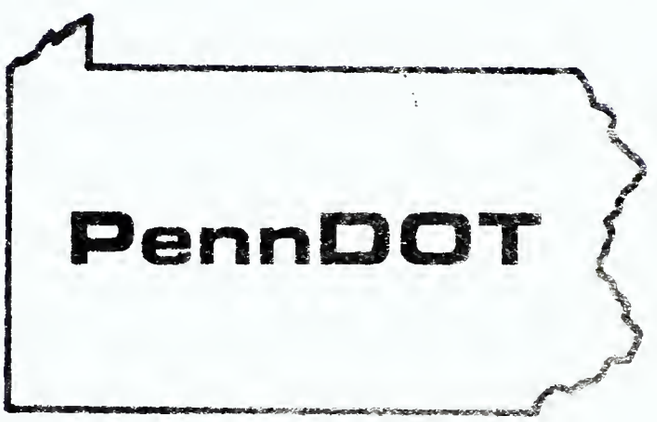
Transportation and Pennsylvania's Future



SUMMARY REPORT OF THE GOVERNOR'S COMMITTEE FOR TRANSPORTATION

January, 1969

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INTRODUCTION

The context of American life is change—rapid, far-reaching change—in every aspect of our economic, social and community life.

Some of these changes are altering the patterns of public and private transportation which served us well in the past. Inadequacies of present transportation became visible in the 50's and painful in the 60's. They will escalate to crippling and disastrous proportions in the 70's unless we supplement present methods of mobility with new technologies and a more balanced approach.

The need is clear, the possibilities of new technology are clear, and we can see in the U. S. Department of Transportation the pattern of the new coordinating forces which can shape the future.

In 1967, Governor Raymond P. Shafer named a blue-ribbon Committee for Transportation under the chairmanship of Leland Hazard, and at its first meeting the Governor said,

"The first striking shortcoming of our present transportation policy is the lack of an overall objective.

"We have highway plans.

"We have mass transit plans.

"We have port development plans and waterway plans.

"We have inter-city transit plans.

"We have airport development plans.

"But we lack a comprehensive transportation plan that brings together all these separate, but highly essential, plans so they make sense for Pennsylvania's future.

"What we need is a Master Plan for Transportation.

"Such a plan would guide us toward making more intelligent decisions about the kind of new transportation modes we select and how they will interlock with our present system.

"My charge to you today, as you undertake this high responsibility, is to develop for us that Master Plan. At the same time, I am asking you to make a complete study of how we can create a Department of Transportation to develop the plan."

The Transportation Age ahead in the 70's and beyond, like the Space Age developments of this decade, will influence the economies of the regions and the industries in which are centered the new research and development and hardware manufacturing. Jobs and profits can enjoy, or suffer, drastic change. Public investment, with transfusions of Federal funds in new urban, inter-city, and transcontinental transportation *will* mean jobs and economic

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Transportation and Pennsylvania's Future

Summary Report
of the
Governor's Committee for Transportation

INTRODUCTION

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impetus to the whole state of Pennsylvania.

Unlike the outer space program of the 60's, the impact of the transportation age developments of the 70's on the future of the city and countryside, on the quality of life, on the attractiveness to industry seeking access to markets, on the new mix of the transportation manufacturing industry, and on the new look of the carrier industry will be tremendous.

To get from anywhere to everywhere, quickly, comfortably, gracefully, and cheaply, between morning and night —the state which gives its people these opportunities first, will truly be first in all the world.

The Governor's Committee presented him with a design for a Pennsylvania Department of Transportation (PennDOT) last February, and a bill was before the 1968 general assembly incorporating this design for PennDOT. A similar bill will be reintroduced in 1969. Concurrent with this Summary Report, the Committee has presented to the Governor a series of transportation studies, and a Master Plan for transportation in Pennsylvania's future.

In addition to a detailed inventory and evaluation of potential transportation developments which may be acted upon by PennDOT, the Master Plan offers a computerized strategy for the input and feedback of every development in transportation techniques, needs, and funding, every change in our population and employment statistics, every new requirement of Pennsylvania's citizens as the years go by, to come up with a continuous, systematically updated sheaf of facts and information for the use of PennDOT planners and their legislative sponsors. Far from the usual conception of a plan, for transportation or anything else, Pennsylvania's Master Plan is a sophisticated mathematical program which makes it possible at any moment to come up with an accurate picture of transportation needs in the Commonwealth PLUS a list of suggested means of fulfilling those needs. Not only will it identify needs, but by making it possible to have at any time an accurate picture of both costs and benefits, it will enable Pennsylvania to get the most from every tax dollar.

Thus, the two major recommendations of the Governor's Committee for Transportation—the design for PennDOT, and a Master Plan for the guidance of Pennsylvania's planners and legislators—go hand in hand, toward the solution of one of society's most pressing problems: mobility. Programs are useless if they are scattered among dozens of responsible agencies, few of them aware of the others' plans or needs: thus, a PennDOT. No agency can function in the absence of accurate information or plans for action: thus, the Master Plan.

Now is the time to take action. Shall Pennsylvania move —and move forward? Shall Pennsylvania lead—lead in its ability to satisfy the needs of its own citizens, and lead the nation in the swiftly-growing new transportation industry? It is a time of possibilities. Pennsylvania can lead. Pennsylvania can move—in fact, Pennsylvania can take a giant step forward, NOW.

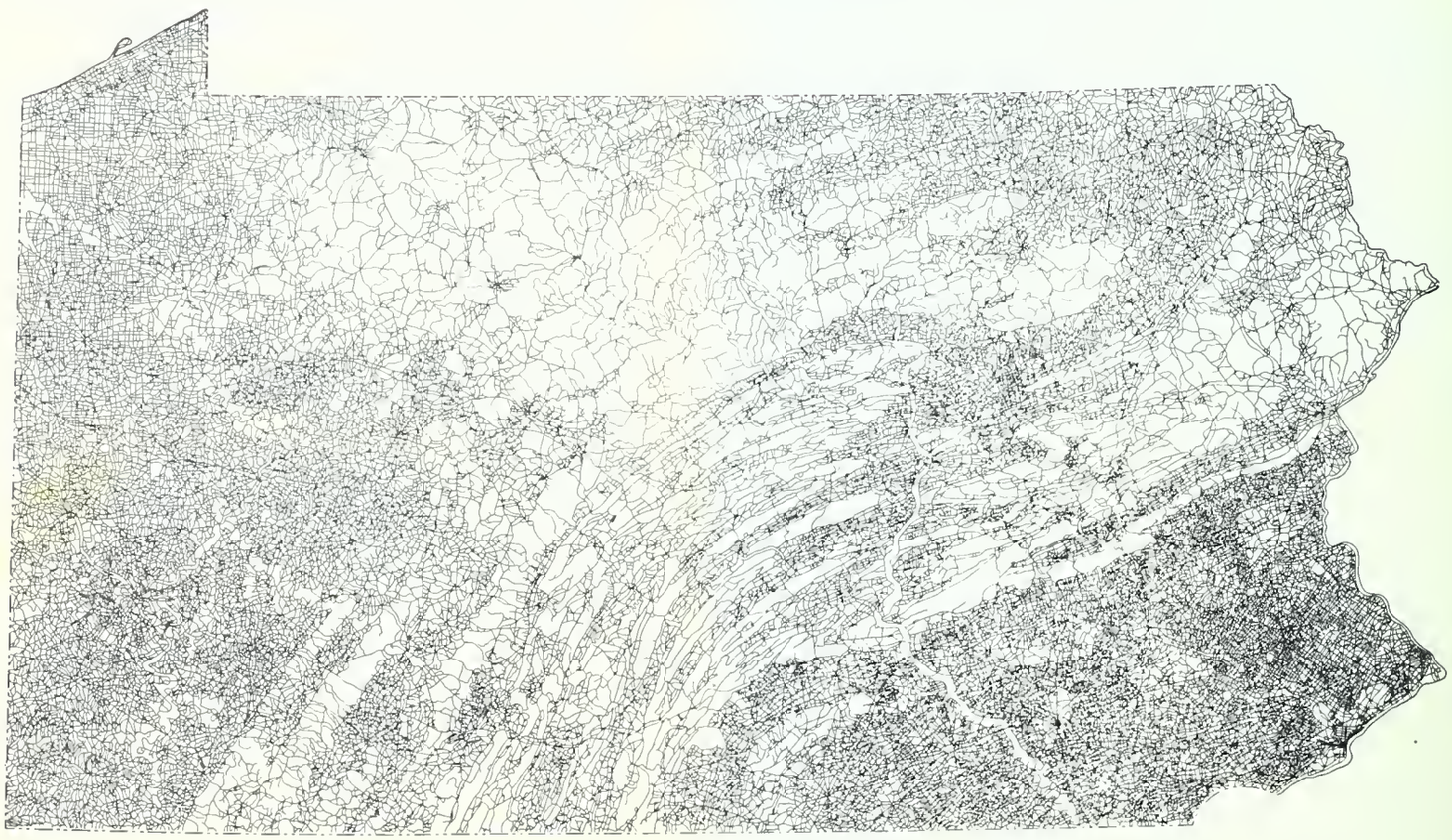


Figure 1. Composite Map of All Streets and Roads in Pennsylvania.

WHERE WE STAND

Transportation is big business in Pennsylvania. In fact, it is the biggest. Each year we spend 3½ billion dollars to move 3 billion passengers and more than half a billion tons of freight into, across, out of, or within the borders of Pennsylvania. Transportation ties our society together; it gets us to the places we live, work, earn, and play. A little over a year ago, Governor Raymond P. Shafer appointed a Committee for Transportation, charged with devising a Master Plan for transportation in the State, and a design for a Department of Transportation, PennDOT, to provide for its administration.

Little wonder that the Governor saw a need for something to be done! Every day there are:[1]

- 200 Scheduled "through" trains moving over the state's major rail lines
- 8,500 Airplane take-offs and landings
- 6,000,000 Motor vehicle trips, totaling 150,000,000 miles of travel daily

In the course of a year, our transportation network carries more than:

- 3,120,000 Intercity rail passengers on major rail corridors
- 7,450,000 Air carrier passengers
- 26,000,000 Rail commuter passengers
- 365,000,000 School bus passengers
- 475,000,000 Local transit passengers
- 2,000,000,000 Automobile passengers;
- 77,000 Tons of air cargo originating in Pennsylvania cities
- 42,000,000 Tons of petroleum moving through the pipelines
- 130,000,000 Tons of waterborne cargo moving through Pennsylvania's Ports
- 225,000,000 Tons of freight moving over the highways
- 291,000,000 Gross tons of freight moving over the major rail corridors

There are at least three billion passenger trips in Pennsylvania each year, or 250 trips for each person, not counting those trips made by intercity bus, by taxi, bicycle, motorcycle, on Pittsburgh's inclines, in Amish buggies, or on foot, while the freight carriers move some 700 million gross tons of freight each year.

Involved in all this motion are:[2]

- 5,200,000 Licensed Drivers;
- 4,970,000 Registered Motor Vehicles including:
  - 4,300 Taxicabs;
  - 10,800 School buses;
  - 540,000 Trucks of all kinds.
- 3,048 Registered aircraft;
  - 11 Class I Railroads, 27 Class II Railroads, and
  - 13 Switching and Terminal railroads;
  - 15 Scheduled air carriers;
  - 11 Scheduled air-taxi services;
  - 150 Steamship lines serving the Delaware River ports and Erie;
  - 170 Domestic Waterway carriers;
  - 13 Major petroleum pipeline companies;
- 3,764 Motor freight carriers based in the state;
  - 38 Local transit companies;
  - 228 Other bus companies;
  - 458 Taxicab companies or individual owners of Taxis.

Total figures showing what the people of Pennsylvania spend for transportation can only be estimated, because many interstate carriers do not keep records which show revenues and expenditures by state. But we do know that:[3]

- Air carrier receipts in Pennsylvania now total about $150,000,000 a year, mostly for passenger service;
- Regulated carriers on Pennsylvania waterways had operating revenues of $168,000,000 in 1966;
- From liquid fuels taxes and motor licenses and fees, the Commonwealth of Pennsylvania took in $340,000,000 in the 1965-66 fiscal year;
- Pennsylvania based motor carriers had operating revenues of $687,000,000 in 1966;
- Total railroad revenues from Pennsylvania interstate traffic in 1966 approached $2,000,000,000, while about $97,000,000 was derived from intrastate rail services, mostly for freight service;
- Total local transit passenger revenue was $119,000,000 in 1966;
- The gross operating revenue of all Taxicab operations was $43,000,000 in 1966;
- Commuter trains gross about $13,000,000 a year.

Clearly, the people and industries of Pennsylvania are spending a very large amount of money to move themselves and their goods, 3½ billion dollars a year at the least, and no single legislative or regulative group is concerned in planning for the inevitable increase in movement, congestion, and cost.

Transportation is one of the supporting services of our society, like national defense, education, housing, employment security, police protection, health, recreation, water supply and sewage treatment, and communications. Ultimately the purpose of most of these services is to give every one of us opportunities to live, to work, and to pursue happiness as we wish. Most of these services are usually also regarded as desirable ends in themselves. But transportation is not an end in itself; it is a means to take advantage of all the other services and opportunities and pleasures. For most of us, most of the time, it is not just to be able to move that is desired, but the chance to get *somewhere*—to work, to school, to shop, to go to the library or to a ballgame, to go sightseeing, to visit friends, to make a business trip, or to go fishing—and to get home again without delays and frustrations on the way. For industry, transportation means the opportunity to bring in raw materials, to get employees to work, and to ship products to markets. Transportation ties our society together, and widens the choice of opportunities available

[1] Appendix to GCFT Project #4 (see Appendix IV, List of Reports, below).
[2] Project #4, and Appendix.
[3] Ibid.

to each of us. Transportation policy can directly affect the relative competitive advantages of different areas by making some more accessible than others, and can influence a region's growth rate, by making the region a more desirable place in which to live, and a more successful producer. Transportation policy can be a powerful tool for the Commonwealth of Pennsylvania to use for the future development of the state.

WHERE ARE WE GOING?

As we have seen, transportation's problems are so complex, its costs so great, that public decisions on how to divide our resources among transportation and other services must be based on comprehensive planning which looks at all the social consequences of alternative actions, as well as at capital investment costs. Without a coordinated, comprehensive approach, we cannot make the best use of our resources. And without an agency to carry them out, the best of plans can be ineffective.

In the near future, we have important decisions to make, as a State. Perhaps the greatest is "What sort of state is Pennsylvania to become?" The topography of the state determined the sites of our industrial development and the links of our transportation system along the waterways which joined those sites to each other and to the areas where the natural resources were. This network, with improvements and additions and perhaps some wholly new elements, all reflecting the technological resources of our time, is the instrument through which transportation policy today can affect the economic development and future population growth of the state.

The urban areas of the state, where 75% of our population lives, have the worst transportation problems, both in the rapidly growing southeast and in the more slowly growing southwest. Most of the badly overcrowded highways in the state are in these two areas, as Figure 2 demonstrates. Less easily documented, but also serious, is the difficulty of transferring people and freight from one mode of transportation to another at a terminal point. When the board of an urban transit authority cannot make a decision which might ameliorate local traffic problems because the member needed to make a quorum is circling the streets hunting for a parking space, an impasse has been reached. That incident in one Pennsylvania city demonstrates how frequently a single trip requires more than one mode of transportation, in this case an automobile and one's own feet; and that congestion on transportation links and in terminals, on city streets and in the parking

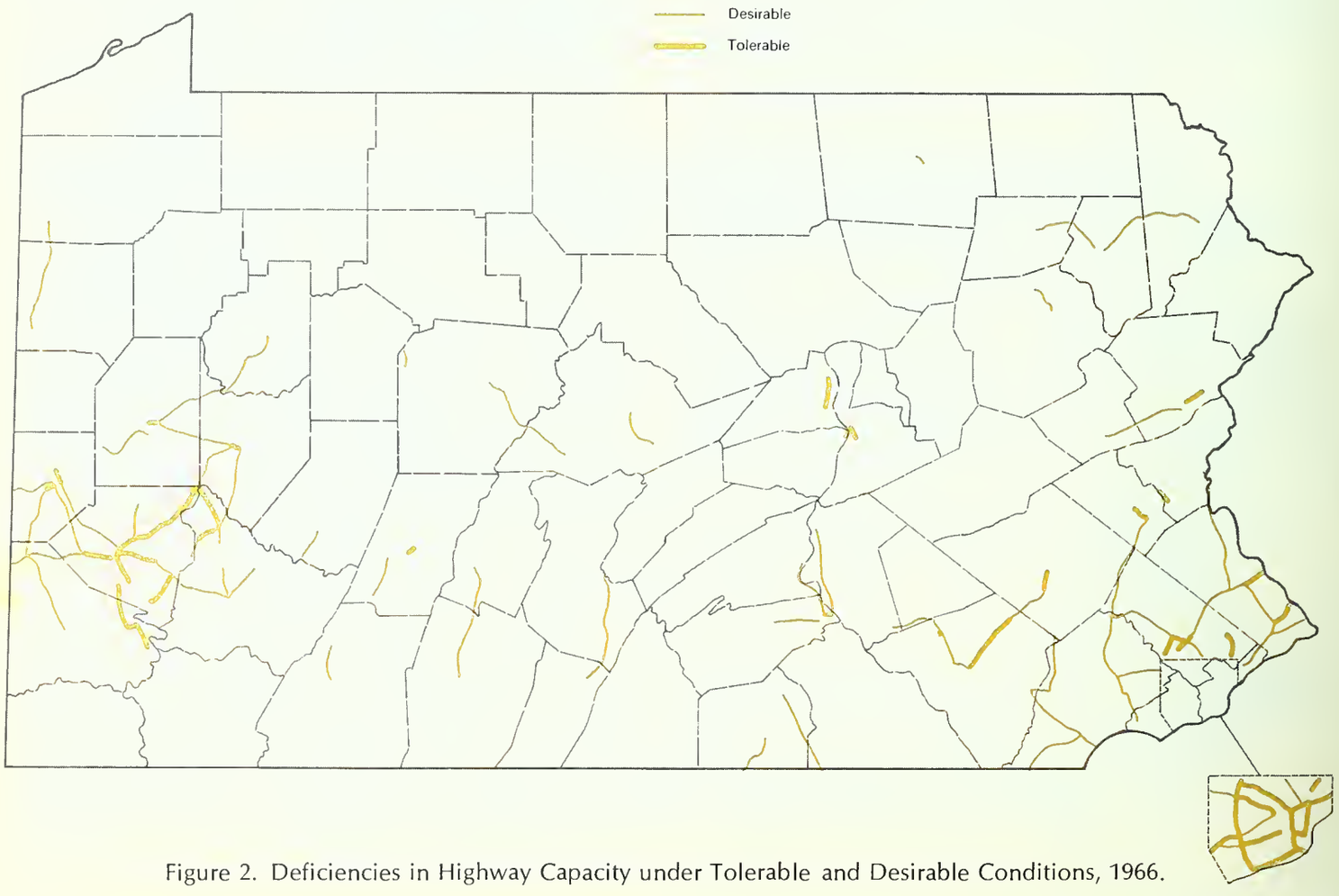


Figure 2. Deficiencies in Highway Capacity under Tolerable and Desirable Conditions, 1966.

place, are interdependent. These two urban transportation problems, saturated urban highways and overloaded terminals, cannot be solved separately, and as the cities continue to spread outward, the problems will become more intense and more widespread.

Thus if improvement of the quality of life in Pennsylvania is our goal, economic development to provide more and better jobs and improvements in transportation must be two major objectives. Figure 3 suggests what Pennsylvania's future may be—a bridge between the two great megalopolitan areas, and a refuge from them, as they continue to spread outward and together. Once more our location, our topography, and our natural resources would determine our future, though this time the natural resources would be our forests and the beauty of our countryside.

If we deliberately plan, we can guide our future development to the advantage of our people. The transportation network we provide can direct the development of the state as a recreation area for the northeastern United States, and part of the midwest, too, by determining which areas shall be accessible and which shall not. If we are to do this well, we must not only plan our transportation network from a comprehensive viewpoint, but we must also preserve the natural resource we are depending upon, the beauty of our state, a natural resource which need never be exhausted if we have respect for the land. The Commonwealth already has made efforts in this area of which we can be proud, because this is what the people of Pennsylvania have wanted for themselves, but these efforts will be doubly important if many more people are to enjoy our land.

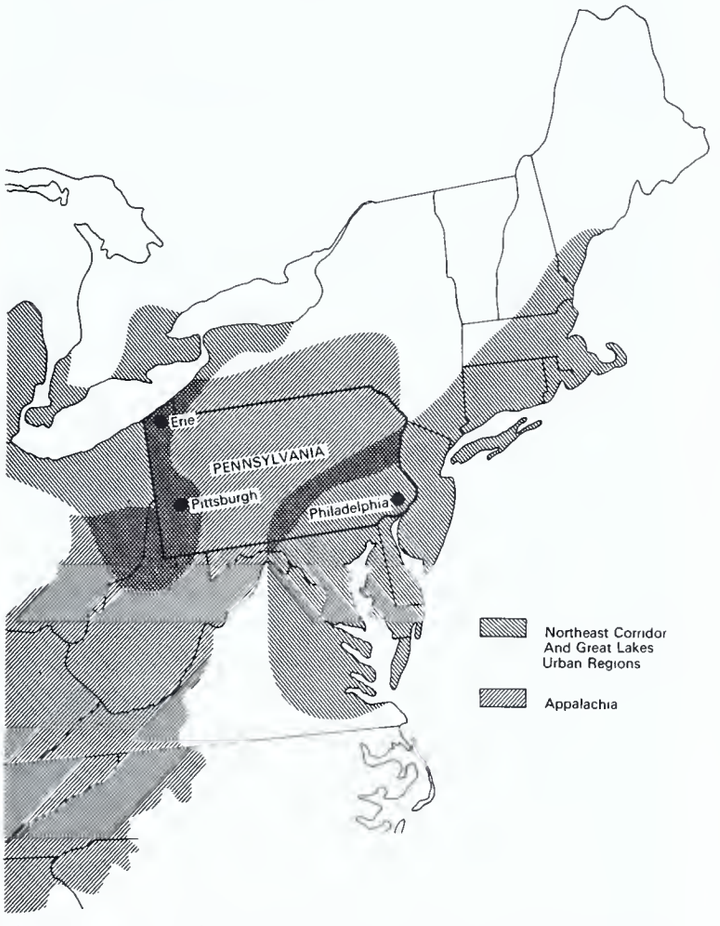


Figure 3. Pennsylvania in Relationship to Adjacent Megalopolitan Regions and the Appalachian Region.

The other role which Pennsylvania might play, as a bridge between Megalopolis to the east and the Great Lakes Urban area to the west, also depends upon what transportation we supply. Highspeed ground transportation between the Philadelphia area and the Pittsburgh area would bring the two great urban regions closer together, channeling people and goods through Pennsylvania, and stimulating economic growth at both ends of the state. Perhaps an intermediate stop part way across the state could be added without sacrificing the high speed necessary for a bridge, and the siting of such a stop (or stops), where growth would also be stimulated, could affect the speed with which the two great urban areas grow together in the center of Pennsylvania. We could try to maintain the gap between them, or to speed the closing of the gap. The siting of stops would determine whether industrial development would occur in depressed Appalachia, or as outward growth from the megalopolitan areas. In other words, as a "bridge" the state will also gain in internal economic growth. But we can also decline to be a bridge, allowing the traffic to be channelled around and above Pennsylvania. The two roles, bridge between megalopolitan areas, and refuge from them, though they could be complementary, are not interdependent. We can choose both roles, one of the two, or neither, as well as encourage or discourage internal growth. But the important point is that we *can* choose in what direction we wish to go in the future, what sort of state we wish to become, what *are* our goals for the future.

A TIME FOR DECISION

Furthermore, this is a very advantageous time for making such a choice. We are now in a period of innovations and improvements in transportation, and the new transportation technology will be our most powerful tool in achieving the goals we choose. A wide range of possibilities is opening up, for increased mobility in urban areas, and between them, and we shall be able to pick and choose exactly what we need. Some of these new ideas have been tried already, like highspeed intercity rail transportation. The New Tokaido Line in Japan has been running 125mph trains very successfully since 1964, and gas-turbine and electric trains planned to have maximum speeds of 160-mph are being tested in this country as Northeast Corridor demonstration projects. Other new high speed ground

systems, such as the French Aerotrain, an air cushion vehicle expected to operate at speeds up to about 250mph, can be in use before 1975. Still other systems, like the Foa Tubeflight System, which envisions a vehicle moving at 300-500mph inside a tube, may not be past the experimental stage by that time; but there are many proposals, some little more than dreams, awaiting the technology which is certain to come.

This great interest in new transportation technology has arisen because our transportation facilities are *not* providing the services we want. For the same reason, we have begun to look more closely at the characteristics of existing transportation modes, and to recognize their strengths and weaknesses more clearly. Thus we can see how to make better use of existing technology, and discover what services existing technology cannot perform, and what therefore has still to be invented.

Pennsylvania's worst present day transportation problems are either at terminal nodes in our transportation network (at the "interface" between modes of transportation) or on the links funneling into large terminals (principally congested urban areas). Some of the new technology is directed at using links more efficiently, but quite a number of ideas, like the rail-bus and exclusive bus lanes, are ways to combine the advantages of two distinct modes and thus to decrease the need for a terminal where these two modes interconnect. Looking at our transportation as a network, we can evaluate the needs for different kinds of services at each terminal, what combinations of modes can provide those services, whether new links are needed or existing ones can be better used. Where the range of choices is small, the final decision may not be very startling, but using the network concept may modify the obvious solution. Where the range of choices is large, the best solution is more likely to be an unexpected one which would not have been suggested by our traditional way of looking at isolated links. Only if we can look at proposed changes in our network as changes in the network, rather than as isolated links, can we use transportation effectively in reaching our goals, to ride the wave of new technology without being swamped by it. And our planners now have computer facilities to make it possible to study complicated network patterns.

URBAN CONGESTION

Much of the new transportation technology is directed towards increasing mobility within urban areas, which are mini-networks within the larger state network. This is important to us in two ways. First, more than 75% of our population already lives within urban areas, and soon the figure will be 80%, so that good urban transportation is a daily need of most of our population. If our urban areas are to be desirable or even bearable places in which to live and work, improved urban transportation is needed. Second, the mini-networks affect the performance of the state-wide network; even our intercity transportation cannot be efficient if movement at both ends is constricted. There is no point in spending vast sums to make it possible to send freight across the state in 3 hours instead of 9, if it takes 24 hours to move through each of the terminal points at its origin and destination. It can now take as long, and even cost as much, to travel 30 miles on the ground getting to one airport and away from another as it does to fly 300 miles from Pittsburgh to Philadelphia. When the jumbo jets begin to fly, carrying several hundred passengers at a time, the result could be an increased door-to-door trip time because of chaos in the airports, unless new methods are developed to handle passengers and baggage, and because of congestion on the access routes.

The bottlenecks in urban areas already exist; action is needed now, not in the future. The highways are overcrowded; public transportation needs help. The Department of Highways *is* planning to provide more capacity, and the cities with State and Federal help *are* acting to improve public transportation both by upgrading existing systems and by experimenting with new ones, such as the Skybus in Allegheny County. Thus two agencies of the state government, the Department of Highways and the Department of Community Affairs, are actively assisting the urban areas at present. A number of others are engaged in various planning, regulatory, and promotional activities related directly or indirectly to transportation. But there is still no formal mechanism to correlate all these various state activities, in urban areas or outside them, though informal consultations certainly take place. A coordinating mechanism such as a Department of Transportation would allow more effective comprehensive planning and action, both by the state and by local agencies.

THE "INTERFACE"

The improvement of urban transportation will require a mixture of existing and new technology, especially for passenger movements, but great improvements could be made by better use of existing technology now, at terminals. The terminal is a place where a passenger or a piece of freight moves from one kind, or mode, of transportation to another. This is the transportation "interface." The passenger changes from a plane, train, or bus, to another bus, a taxi, his own automobile, to rapid transit, or even occasionally becomes a pedestrian; freight is transferred between ships, barges, trains, trucks, pipelines, planes, or even private automobiles. Facilitating this transfer from one mode to another could speed-up intercity transportation services significantly. The confusion which may reign in the larger airports when the jumbo jets start flying is one example of an interface jam, and the Delaware River

Ports provide another example. Most of the public pier facilities for handling general cargo, that is non-bulk cargo, were built long ago, and while they are still usable, they are obsolete and inefficient by modern standards. They are too small for modern cargo ships, with skimpy rail connections and without adequate space for trucks to pick up or deliver cargo, with insufficient storage space, and unsuited to modern containerized cargo handling.

All intermodal terminal plans, whether a new intermodal freight forwarding terminal on the Delaware River, a bonded foreign trade zone, or the development of Olmstead State Airport, require coordinated planning for the different modes of transportation, and in some cases for industrial development as well. This means coordination not only of planning by various agencies of state and local government, but also of planning by private industry. If the state is to plan, promote, or invest in developments which will benefit all the people of the state, it should do so with full knowledge of the intentions of all who would be involved, and with full and accurate information on existing conditions. Duplication of efforts or the making of conflicting plans can be avoided if there is free contact between public and private planning.

Furthermore, the very establishment of a new transportation link can alter the economic structure and population distribution of an area—will affect the pattern of land use, and alter drastically the transportation demands themselves, as well as the location of residential and industrial centers. Transportation plans must be a part of area planning.

PennDOT NOW

In sum, transportation plays a large part in our lives because it can provide us with the opportunity to live, work, and play as we wish. If we decide what the Commonwealth of Pennsylvania should seek to become in the future, we can use our transportation network to further our plans. Since this is an era of innovation in transportation technology we shall have a wide choice of ways in which we can change and improve our present transportation, combining the most suitable new ideas with the best of the older technology, to shape our future.

Single elements of our transportation network cannot be evaluated in isolation, because different forms of transportation interlock, and the efficacy of one element depends upon the existence and efficiency of other elements. If transportation is to be used as a tool to promote statewide goals, it must be looked at as a statewide network composed of all the existing modes of transportation. Only a Pennsylvania Department of Transportation (PennDOT) can have this viewpoint. Successful transportation planning also requires a sure knowledge of other statewide planning for industrial development, for recreation, for conservation, and of both regional and local plans and desires, as well as Pennsylvania's place in the development of the nation as a whole. Again, a Department of Transportation could perform this coordinating function for public and private planning related to transportation.

These are compelling reasons for forming a Pennsylvania Department of Transportation, if we wish to guide Pennsylvania's future. There is also a reason for choosing now as the time to act. This is not only an era of innovation in transportation technology, but also an era of innovation in the techniques of transportation *planning*. Only very recently has it become possible to plan effectively on this scale. Planning is an investment in the collection of information, and the analysis of the information to predict future needs and ways to meet them—a means for reaching well-informed decisions. There have been rapid advances both in the concepts of analysis and in the computational techniques for dealing with large quantities of data. Pennsylvania can become one of the first states to utilize these advances in planning methodology, but it can do so effectively only if there is one single agency charged with the overall responsibility for producing a Master Plan and for collecting and using the necessary information. A committee of representatives of a number of agencies, fitting together piecemeal plans each based on separately collected information, collected with differing standards of accuracy and comprehensiveness, cannot use the most comprehensive planning techniques available. Overall direction is necessary, with an experienced trained staff, working together.

Thus we need a Department of Transportation to produce a true master plan for transportation according to the best current standards for comprehensive planning, and a single agency must gather the indispensable information, deciding what data is to be gathered and how it is to be used. Much of the data which would be necessary to formulate a master plan does not even exist, and much of the data which does already exist on different parts of our transportation system and land use patterns has not been collected at the same period of time or for the same areas, so that we cannot produce from it an accurate overall "map" of what now exists. The sooner we begin to collect the necessary data, the sooner we can have a Master Plan for transportation.

If we have a Master Plan for Transportation, we have an instrument to achieve our goals for Pennsylvania. Those goals, however, must be chosen by the people of Pennsylvania. If we are not to accept passively whatever future role develops haphazardly, we must express our desires, our vision of the future, as individuals and as groups in our communities, for the guidance of our elected representatives. Only then can our legislators harmonize our views to produce a coherent vision of the future we want for Pennsylvania, and act to turn the vision into reality.

THE FORMATION OF THE GOVERNOR'S COMMITTEE FOR TRANSPORTATION

Both the State and the Federal Governments have long played major roles in the development of transportation; in planning, in promotion, and in regulation. However, the growth of State and Federal responsibility for transportation has been haphazard, new agencies being created to deal with new forms of transportation, or with new problems of older modes of transportation. In Pennsylvania, responsibility for the administration, planning, and regulation of transportation rests with hundreds of counties, municipalities, public authorities, and other public, quasi-public or private entities, as well as a number of state agencies, including the following:

The Department of Highways
The Department of Commerce
The Department of Community Affairs, Bureau of Community Development
The Department of Forests and Waters
The Department of Military Affairs, Pennsylvania Aeronautics Commission
The Department of Public Instruction
The Department of Revenue
The Public Utility Commission
The Pennsylvania Turnpike Commission
The Pennsylvania State Police
The State Planning Board
The State Highway and Bridge Authority
The Delaware Toll Bridge Authority
The Delaware River Port Authority

On the Federal level, the same sort of jigsaw puzzle picture existed until the creation of a single Federal Department of Transportation in 1966, consolidating in one department most of the numerous transportation functions which had been distributed among some thirteen agencies, and thus making possible the emergence of a coherent national transportation policy. A number of states have taken the parallel step of forming state Departments of Transportation to coordinate state planning and promotion. New Jersey created a Department of Transportation in 1966, which published a Master Plan for the state in March 1968, concerned almost exclusively with highways and commuter railroads. The New York Department of Transportation was authorized in 1967, and almost immediately afterwards the voters of the state approved a $2,500,000,000 bond issue, half of it to be spent on highways, $1 billion for mass transit, and the remainder for aviation development, while a master plan is being drawn up. Florida and Wisconsin also have Departments of Transportation, and a number of other states have been considering whether they also should create such departments.

Thus Pennsylvania is not alone in recognizing the potential usefulness of a Department of Transportation, but it is unique in the emphasis which has been given to producing a Master Plan for Transportation to guide such a department from its inception. Governor Raymond P. Shafer, at the first meeting of the Governor's Committee for Transportation, which he formed in the spring of 1967, said:

> "My charge to you today, as you undertake this high responsibility, is to develop for us that Master Plan. At the same time, I am asking you to make a complete study of how we can create a Department of Transportation to develop the plan."

The remainder of this report is a description of the work done by the Governor's Committee for Transportation to carry out that charge. Half a dozen reports, totalling several thousand pages, were produced and will be available to the PennDOT organization. (A number of copies are deposited for reference in the following public libraries: the Free Library of Philadelphia, the Fred Lewis Pattee Library at Pennsylvania State University, the Harrisburg Public Library, and the Carnegie Library of Pittsburgh.) Here we are outlining the intent, the methods, and some of the findings of these separate reports, to produce a composite picture of the work of the Governor's Committee for Transportation. If the people of Pennsylvania are to decide when or whether to create a Pennsylvania Department of Transportation, or PennDOT, they should have adequate and accurate information on what a PennDOT would do for Pennsylvania. This report is intended to supply some of that information.

THE ORGANIZATION AND PURPOSES OF THE GOVERNOR'S COMMITTEE FOR TRANSPORTATION

The Governor's Committee has 40 members, representing state government, private industries with a stake in transportation, municipal transportation authorities, and educational and research institutions. Under its supervision is a Technical Advisory Committee of men with technical backgrounds pertinent to the Committee's tasks; it also consults with an Interdepartmental Committee of officers of state departments involved in transportation. Consultants were employed to collect and analyze information, and to draw up comprehensive plans under the Committee's direction. All those connected with the Governor's Committee for Transportation are listed at the end of this report (Appendix II).

The work of the Governor's Committee is divided into two parts: to recommend a shape for a Department of Transportation—how it should be organized and what should be its duties—and to develop a Master Plan for Transportation in Pennsylvania.

The first task was completed and a statement on the organization and functions of a Department of Transportation for the Commonwealth of Pennsylvania, "Penn-

DOT," was presented to the Governor in February, 1968. This design for PennDOT was drawn up after consideration of a detailed proposal submitted by the Interdepartmental Committee and a study of the Federal Government organization for transportation, as well as various types of transportation organization adopted by other states. Since the presentation of the plan to the Governor, members of the Governor's Committee have worked with the Governor's staff in drawing up enabling legislation to present to the General Assembly. Here are the recommendations for PennDOT:[1]

STRATEGIC CONSIDERATIONS IN THE FORMATION OF PENNDOT

The PennDOT organization should give more attention than has as yet been accorded to achieve a well-balanced transportation system—one designed to promote the overall economic, physical, recreational, and cultural development of the State.

Program Planning and Budgeting Systems—Quantitative Analysis

The program planning and budgeting systems approach (PPBS) emphasizes careful formulation of departmental objectives and analysis of alternative ways of meeting objectives. It leans heavily on quantitative analysis, including "systems," cost-effectiveness, and related types of analysis. One of the most important problems involves the possibility of trade-offs among various transportation modes to link people to jobs and goods to markets.

Local Area Transportation and Development

The trend toward urbanization will continue, which means that problems of urban transportation will be no less important than problems of inter-community transportation.

If PennDOT is to be effective in helping to solve local transportation problems, it must have staff capability with a multiplicity of disciplines, including comprehensive community planning, to work continuously with local transportation and developmental interests, to provide technical assistance for planning, project preparation, and applications for funds. Otherwise, the State will be outflanked by the rapidly expanding expertise at the federal level, and will fail to be a catalyst for the understanding and solution of local transportation needs.

Relation to Comprehensive State Planning and Budgeting

Transportation's crucial role in overall state economic development and in development of major regions of the state makes it essential to link transportation to agencies charged with comprehensive development planning.

The Committee sees no need in the foreseeable future for changing the state constitutional provision that earmarks liquid fuel tax revenues for "highway and related purposes." There has been a gradual broadening of the concept of appropriate "related purposes," and it is likely that such broadening will continue. It is likely also that the next wave of federal highway financing will extend the use of motor fuel tax revenues to such matters as improving the environment of existing roads, increasing the capacity of highways (by vehicle monitoring and control devices), adapting highways for mass transportation vehicles, and the like.

[1]From Project #3.

ORGANIZATION AND FUNCTIONS OF PENNDOT

The Secretary

The Secretary should be the executive head of PennDOT. He should be assisted by a chief deputy secretary. The Office of the Secretary should be responsible for the functions of operations review, public relations, intergovernmental relations, and legislative liaison, some of which functions are now performed by the Operations Review Group and the Bureau of Public Information in the present Department of Highways.[1]

In summary, the Committee identifies six areas of concern meriting the attention of a deputy secretary or his equivalent: (1) program planning and budgeting, (2) administration, (3) highways, (4) safety, (5) research and development, and (6) local area transportation assistance.

1. Program Planning and Budgeting

PennDOT should include a strong central planning capability which is intimately related to programming and budgetary procedures. These activities form a continuum which if broken separates long-range thinking from the realities of implementation and narrows the sights of those involved with immediate budgetary matters. So-called "capital" and "current" expenditures overlap and offer opportunities for various kinds of trade-offs. To take a simple instance, there is frequently a choice between (1) high initial capital expenditures and low annual maintenance costs and (2) low initial capital expenditures and high maintenance costs.

Coordination with Other State Planning

The planning and administrative agencies in the Office of the Governor should:

Provide guidelines relating to overall state development and priorities;

Review transportation development plans and capital budget programs;

Maintain continuous liaison with the transportation planning-budgeting unit.

[1]The office would include also the departmental counsel and comptroller. Although a part of the departmental organization, these functionaries report respectively to the Department of Justice and the Office of Administration, as is prescribed for all Commonwealth departments.

2. *Administration*

This function involves general administrative or "housekeeping" activities and improvement of management and operations, including:

Office services,
Personnel management,
Management information systems,
Operations analysis and management improvement.

3. *Highways*

The highways function involves:

Design,
Construction,
Maintenance,
Real estate (acquisition and management),
Materials and testing,
Traffic engineering.

4. *Safety*

Because of the close relationship of highway safety to highway design, traffic control, and motor vehicle use, PennDOT should assume responsibility for major highway safety functions, most of which are now performed by the Department of Revenue:

Motor vehicle registration,
Motor vehicle operator licensing,
Traffic Safety and Safety Research.

5. *Research and Development*

This function involves research, experimentation, and development. These are the activities most needed at present for improving, expanding, and coordinating the various transportation modes.

The Committee believes that an imaginative program of research and development would command funds and the cooperation of research resources from federal agencies and from corporations, universities, and foundations. Much of the technical analysis utilized for program planning and budgeting would stem from this unit.

Technological Research and Development

There should be a vigorous central research and development activity concerned with, among other things:

Improvement and innovation of modal systems, including air, water, high-speed and other rail, trucks, buses, pipelines, and mass transportation; highway construction and operation.

Vehicle monitoring and traffic controls, new techniques for public transportation such as "taxi-bus" arrangements, highway automation, and coordinated multimodal transportation facilities.

Techniques of improving transportation services, particularly in areas now neglected by both public and private agencies, such as improving systems of small shipment services, inter-line and inter-modal transfers of freight and passengers, service to rural areas, efficiency of terminals.

Research on Environmental Design

PennDOT will necessarily be increasingly concerned with the impact of various proposed transportation projects on the surrounding environment.

Research on Services and Regulations

In view of the importance of making regulations a positive tool of transportation development, PennDOT should do research on common carrier routes, schedules, services and rates, and needed adaptation to changing conditions.

Research and Development Programs.

An important part of the research function is collecting information on results of research and development activities carried on elsewhere and analyzing applications to Pennsylvania transportation needs.

6. *Local Area Transportation*

This function involves transportation development in local areas, assisting local areas in developing transportation plans and systems which best meet their own special needs, and helping to assure adequate service to all local areas. Activities would involve:

a. Provision of technical assistance.
b. Administration of state and federal funds for local area transportation and development. The local area transportation function would take over the urban mass transportation program now in the Department of Community Affairs.
c. Air Transport. In addition to the crucial role of research, development, and promotion in furthering air transportation, there are certain administrative functions now performed by the Pennsylvania Aeronautics Commission, located in the Department of Military Affairs. These have to do with evaluation and certification of airports, checking of air safety violations, and investigation of accidents. In addition, the State operates five airports, including the York-Harrisburg Airport and the Olmstead complex. PennDOT should take over these activities.
Local areas should be centrally involved in the location of airports, the planning of their facilities, and the design of transportation linkages to and from the airports.
d. Water Transport and Port Facilities. In addition to research on and development of water transportation, PennDOT should take over present functions dealing with licensing pilots and reviewing changes in wharves and piers in the Delaware River.[1] It should also assist in the planning and development of important local and metropolitan transportation terminal facilities.
e. Encouragement of Effective Local Action. One objective of PennDOT should be to increase local government capacity for effective transportation planning and improvement, on the grounds that decisions vitally affecting local and regional development should be made, insofar as possible, by the governments concerned. Such agencies as the Port

[1]These activities are now performed by the Delaware Navigation Commission, an agency of the Department of Forests and Waters. Under this proposal the Commission would be abolished. The maintenance and operation of the *S.S. Commonwealth,* now also a duty of the Commission, may be more appropriately carried out by the Department of Commerce.

Authority of Allegheny County, Southeastern Pennsylvania Transportation Authority, and the Delaware Valley Regional Planning Commission furnish precedents for metropolitan and regional organization. Over a period of time, responsibility for designing, constructing, and maintaining secondary state and local roads should be returned to local government agencies, (a) to build up their own competence in the field of transportation, (b) to better meet their pressing needs as perceived locally, and (c) to relieve PennDOT of the onerous burden of work done on essentially local systems. (The 43,000 miles of highway for which the State is now responsible approximates the combined mileage under the jurisdiction of highway departments of all other Middle Atlantic States plus the New England states.) Funds for such purposes should be made available to the localities through a grant-in-aid system.

OTHER RECOMMENDATIONS

Pennsylvania Turnpike Commission

PennDOT should have the same type of review power over extensions and modifications to the turnpike system as the State Department of Highways currently exercises. In the long run, the entire turnpike program should be integrated with that of PennDOT.

Regulation

To the extent compatible with the Pennsylvania Constitution, the regulation of essentially local services, such as taxicabs and local bus companies, should be performed by local or regional public transportation agencies meeting specified state-wide standards and conditions.

PennDOT should be able to intervene as a party in interest before the Public Utilities Commission, Interstate Commerce Commission, and other regulatory bodies.

School Busing

The Department of Transportation should be notified by the Department of Public Instruction concerning all plans for school construction and should have the opportunity to evaluate and comment on the highway and other transportation problems which would be created by various alternative locations.

Advisory Commissions and Committees

The Committee is persuaded that the existing State Highway Commission can serve a useful purpose for the time being in assisting the Secretary of Transportation and the General Assembly to formulate transportation policy and allocate highway funds. As the new mechanisms proposed in this report develop over time, the Committee believes that the functions of the State Highway Commission should evolve into an advisory function and that this function can be best performed by ad hoc groups formed to deal with specific subjects. An alternative is to reconstitute the Highway Commission, which then would include also representatives of non-highway modes and local area interests, as a State Transportation Advisory Commission. Meanwhile, the Secretary of Transportation should be encouraged to convene advisory committees on any subject for which he needs assistance and support.

WHAT IS A MASTER PLAN FOR TRANSPORTATION?

The second task of the committee—developing a Master Plan for Transportation—occupies the rest of this report. This was not a simple task. First, the Committee had to consider what exactly is involved in planning for the future.

Rational planning requires that we must:

(1) Find out what already exists, how far it meets our current needs, and how much extra capacity is available for future needs.

(2) Forecast what our future needs will be.

(3) Consider all the possible alternative ways to fill those needs.

(4) Decide on what basis we will make a choice amongst the possible alternatives.

Completion of these four steps leads to a Master Plan for Transportation in Pennsylvania.

LITERATURE SURVEY

A bibliography of published material on transportation in Pennsylvania and elsewhere was prepared for the use of the Governor's Committee and a future Department of Transportation. It contains some 600 items, arranged alphabetically by author, with a subject index. The contents of each entry are summarized briefly. The subjects covered include many aspects of ground, air, and water transportation, including planning, research, economics, regulation, law, new technology, administration, statistics, methods of analysis, projections, operation, and socio-economic effects. It is an inventory of the available recent literature on all aspects of transportation.

Thus the first step has been carried out as far as possible using already available information. There are large gaps in our knowledge of our transportation network, but once we have gone through the other steps towards producing a Master Plan it will be clear which gaps must be filled first, and in what form information ought to be collected in order to be most useful.

INVENTORY

The second step was to make an inventory of the existing transportation facilities in the state, with information on their capacity for moving passengers and freight, and how much this capacity is already being used, under the supervision of the Technical Advisory Committee. The consultant's job was to collect all publicly available information already existing on highways and such forms of road transportation as buses and trucking; on railroads; on pipelines; on urban transportation; on the waterways of

Pennsylvania; and on air transportation; and to analyze the capacities of existing freight and passenger facilities and their present degree of utilization. Although there are some facets of our existing transportation network on which there is no publicly available data, the job did not include the collection of new information because of the short time in which it had to be done. Even with the gaps which were found to exist in our knowledge of the present transportation facilities of the state, a sizeable quantity of data was gathered in two large volumes under the title "Inventory and Adequacy of Existing Statewide Transportation Systems,"[1] which is probably the most comprehensive inventory ever made for any region of the United States.

FORECASTING FUTURE NEEDS

The vital next step is forecasting our future transportation needs. The first question we have to decide is how far into the future we are looking. Usually it is expected that a Master Plan will look ahead perhaps twenty or twenty-five years, that is, to about 1990. This doesn't mean that we want to make a plan for the next twenty-five years, and then forget about planning until the period is up, when we would make a new 25-year plan. Rather we want to develop the kind of plan which can keep looking ahead with periodic review and revision continuously during that period of time, capable of being extended into the future at each review. The initial development of such a plan, while it is a very big step, is only the beginning of a continuous effort to plan well in advance of the time when we must meet our future needs.

How can the demand for transportation in the future be predicted? Methods of forecasting range from the guess, pure and simple, to complicated mathematical techniques. For a guess, no numerical information may be needed, but as the method of forecasting becomes more and more complicated, more and more initial information will be required. The predictions should also become more and more accurate, if the initial information is accurate.

If the future demand for transportation on one particular link of a transportation system is to be predicted with accuracy, it is necessary to know not only how much capacity already exists on that link and how much of it is utilized, but also, for instance:

- How rapidly is the use of the link increasing or decreasing?
- Where is the traffic on this link coming from and where is it going; how does this link fit into the total network?
- Will improvements on this link divert traffic from other links, and will changes in other transportation links affect the traffic on this link?
- Will improvements on this link generate wholly new traffic that didn't exist before, either by filling a latent need for transportation or by stimulating new socio-economic development?
- Will congestion or changes at the nodes or terminals at both ends of the link affect the traffic on the link?
- Will plans for other public or private investment affect this link, by changing the traffic or by competing for the same resources which could be used to improve this link?

If this kind of information is available, the individual link can be considered as part of the whole transportation network, and the interactions of transportation with socio-economic activity can be considered in a mathematical treatment requiring the use of a computer to produce an accurate forecast of future demand for transportation. If the information is not available, then either time must be taken to collect it or else we will have to settle for a less accurate prediction.

In the past, only the simpler methods of predicting future needs have been used, those which required knowledge of existing capacity, population, and current growth trends. The answers to the other questions were usually ignored, and, because the needs were usually critical by the time planning began, there was typically no time to find the answers. It is because these simpler ways have not been very successful that planners are now moving to much more complex methods in order that policy decisions can be made rationally, on the basis of the best information obtainable.

The "Inventory" survey of existing facilities in Pennsylvania[1] shows what information already exists, and it also shows the large gaps in our information. For instance, in working out network-scale plans, there is almost no information on how the competition between different modes affects the distribution of freight and passengers among the different modes.

Quite clearly there is not enough information now available for accurate prediction of demand or for complex planning activity using the many kinds of variables which were described above. It is possible to make approximate short term predictions which won't be too far wrong, but any long term predictions we make could contain such large errors that they are valueless.

However, the "Inventory" also shows that there are some parts of our transportation network which are now being used at, or very close to their full capacity. If *any* growth in demand occurs in these spots, we are in trouble. Something has to be done about these right away—we can't wait several years to collect data and develop an intricate forecasting model. We have to make the best predictions we can with the information we now have, and plan ways to relieve the pressure in the near future.

[1]GCFT Project #4.

[1]GCFT Project #4.

In other areas, the needs are not yet critical and we do have time to develop better prediction methods.

Fortunately the areas where the needs are critical now are also those which have been studied the most extensively, and for which most information is already available; so immediate action will not be completely blind. The needs of urban areas have been studied in the framework of local networks, though not as part of a state network. The highway system has been considered to some extent as a state-wide network, though not as part of a multimodal network. Therefore there is some basis for making judgments on action to meet immediate needs.

The Governor's Committee for Transportation divided the job of planning into two parts. One is a study of short-term demands,[1] with a tentative horizon date of 1975, based on existing information. This study leads to a short-term or interim plan,[2] suggesting an order of priority for the correction of the more critical difficulties identified in the demand study. This is an immediate action plan for PennDOT. The other part of the planning job is the devising of a strategy for a Master Plan,[3] recommendations to PennDOT on how to develop a Master Plan, the designing of the necessary complicated mathematical models, and indications of what information must be collected in order to use the models. The end result of using this long-range Master Plan would be a "map" of the total transportation network of the state at some future horizon year.

THE DEMAND FOR TRANSPORTATION IN PENNSYLVANIA UP TO 1975

The demand study[4] was directed primarily toward estimating, in terms of traffic flows, the intercity passenger and freight demand which will be placed on existing major transportation facilities by 1975. Future flows were predicted and compared to existing capacity plus already planned improvements, in order to derive the requirements for new facilities. Ideally the study would have identified the principal factors influencing passenger and freight demands; such environmental factors as population, income, and patterns of employment, and such transportation factors as price, travel time, convenience, reliability, and safety. But a lack of both time and data prevented the reaching of such definite conclusions. Since it was clear from the beginning that there were substantial deficiencies in the amount and kind of data available, identifying these gaps became another essential purpose of the study.

The methods used to estimate future demand were statistically simple, because the quantity of available data was small. In most cases, the existing trend for a given mode over the last few years was considered, and the best straight line was fitted to this, or else the most recent existing figure was multiplied by an arbitrary growth factor, such as 10% per year.

Usually an attempt was made to bracket the future demand: to give an optimistic estimate and a more conservative one, and to say that demand will lie within a range rather than to predict a single value. Since the five years from 1962 to 1966 have generally shown higher travel trends than the longer period of 1955 to 1966, it is possible to obtain high and low estimates by considering the recent trend compared with the longer time trend. In the past, transportation demand forecasts have almost always been too conservative.

The prediction methods used here have important limitations, which must be kept in mind when the resulting demand estimates are considered:

(1) Travel projections for each mode were made independently of projections for all other modes. This implies that all factors affecting demand and competition between modes will exert the same influence in the near future as in the recent past. Although there are real interactions between transportation systems in supply and demand, we can't describe them quantitatively with the existing data.
(2) Changes in travel behaviour resulting from underlying changes in consumption preferences and patterns of economic activity are ignored.
(3) The forecasts are a "do-nothing" set of projections, in which Pennsylvania's population out-migration and economic decline in certain areas are assumed to continue, even though a transportation system has direct effects on the economy it serves. An improved transportation system should make the state more attractive to new industries, thus increasing employment and population, which will in turn increase the demand for transportation.

There are also additional assumptions made in this study which would be shared by a more sophisticated study: that the world political climate will remain relatively unchanged; that there will not be a major economic recession; and that there will not be a serious depression in international trade, or any other catastrophic occurrence. Fortunately, as the interim plan merges into the "Master Plan," we can dispense with the "do-nothing" approach and apply the more complicated interlocking network factors.

POPULATION TRENDS

Before looking at the future transportation demand, we need to know something about trends in population and employment in the state, since these will help shape the transportation demand. The Demand Study relied on socio-economic forecasts which had been made for an earlier highway needs study in Pennsylvania and which

[1]Project #5.
[2]Project #6a.
[3]Project #6b.
[4]Project #5.

were based on population and employment forecasts drawn up for the State Planning Board. Although these socio-economic projections are already out-dated, their accuracy is consistent with the simple prediction techniques used in the demand study.

Pennsylvania's population growth has been very slow since World War II, because the Commonwealth's natural resources are no longer so important to the nation's economy. The decline of the coal mining industry depressed employment in the state and slowed population growth. Out-migration of population has been significant. Although population and employment are projected to grow more rapidly in the 1960's and 1970's, the rates will still be less than the national averages, and less than those for adjoining states except the Appalachian state of West Virginia.

Population density and employment opportunity are interrelated, and both affect the quantity of traffic in a given area. Population density is expected to increase in all but four of Pennsylvania's metropolitan areas, while the average density in non-metropolitan areas, except for the Pittsburgh-Erie Corridor, is not expected to change much. In general, the highest growth rates will occur in and around the largest metropolitan areas, especially on a north-east to south-west axis from Bucks to Adams Counties (i.e., outward growth along the Northeast Corridor) and between Pittsburgh and Erie. Employment trends are similar.

Population and employment trends and projections are given in *Table 1* and shown graphically in Figures 4 and 5. Remember, these projections are the "do-nothing" forecasts, based on past trends, which do not allow for any effects of improved transportation or economic development programs on our economy.

In summarizing the findings of the demand study, we can look first at the total volumes of intercity passenger travel by all modes projected for the U.S. and for Pennsylvania in 1975. Figure 6 shows the trends in Inter-City Passenger Mileage for the U.S., and illustrates the dominance of the automobile in passenger movement, as well as predicting that major growth will be in automobile and air traffic. Figure 7 compares trends in number of passengers predicted for various modes for the U.S. and for Pennsylvania in intercity travel.

The Pennsylvania predictions are more speculative than the U.S. ones. The Pennsylvania prediction of rail passenger traffic shows a marked growth compared to declining national rail passenger trends because of the influence of the Northeast Corridor, which it is hoped will have a 20% annual growth rate.

TABLE 1

Population and Employment Trends and Projections for Pennsylvania Standard Metropolitan Statistical Areas and Remaining Areas: 1950-1975

SMSA (Standard Metropolitan Statistical Area)	Population in Thousands			Total Estimated Employment in Thousands		
	1950	1960	1975	1950	1960	1975
Philadelphia*	3,142.7	3,591.7	4,463.7	1,343.1	1,497.4	1,791.8
Allentown-Bethlehem*	383.5	429.0	500.1	164.7	177.8	205.8
Harrisburg	292.2	345.1	459.3	137.0	159.2	203.7
Reading	255.7	275.4	305.4	111.4	118.0	128.5
Lancaster	234.7	278.3	344.5	98.9	113.0	140.0
York	202.7	238.3	305.4	86.9	98.2	123.9
PERCENT OF STATE	43%	48%	50%	45%	51%	54%
Pittsburgh	2,313.2	2,405.4	2,666.7	850.6	880.4	958.9
Wilkes-Barre-Hazleton	392.2	347.0	310.8	145.4	114.1	100.9
Johnstown	291.4	280.7	264.7	98.8	82.5	77.9
Scranton	257.4	234.5	229.8	96.2	85.7	77.4
Erie	219.4	250.7	314.3	88.8	88.0	109.0
Altoona	139.5	137.3	132.7	48.8	46.9	44.3
ALL SMSA'S as Percent of State	77%	78%	80%	80%	81%	83%
Remaining Areas	2,373.4	2,506.6	2,581.1	827.8	797.2	821.7
Percent of State	23%	22%	20%	20%	19%	17%
Pennsylvania TOTAL	10,498,000	11,320,000	12,709,000	4,098,400	4,258,400	4,783,800

*Includes Pennsylvania Counties only.

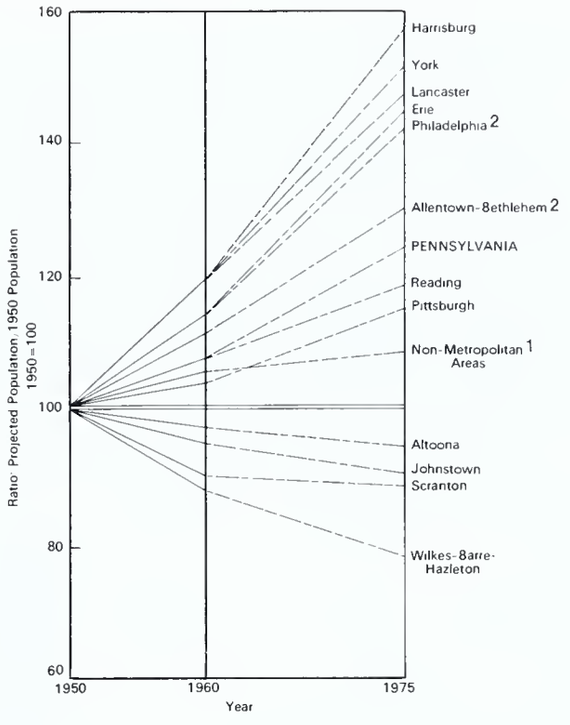


Figure 4. Comparative Population Trends and Projections for Pennsylvania Metropolitan and Non-Metropolitan Areas: 1950-1975.

[1]Metropolitan areas include counties within the boundaries of standard metropolitan statistical areas in 1960.

[2]Includes Pennsylvania counties only.

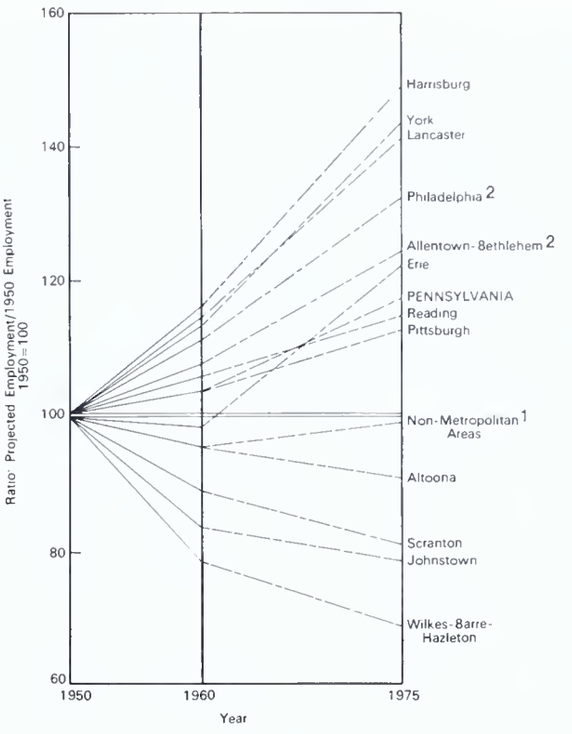
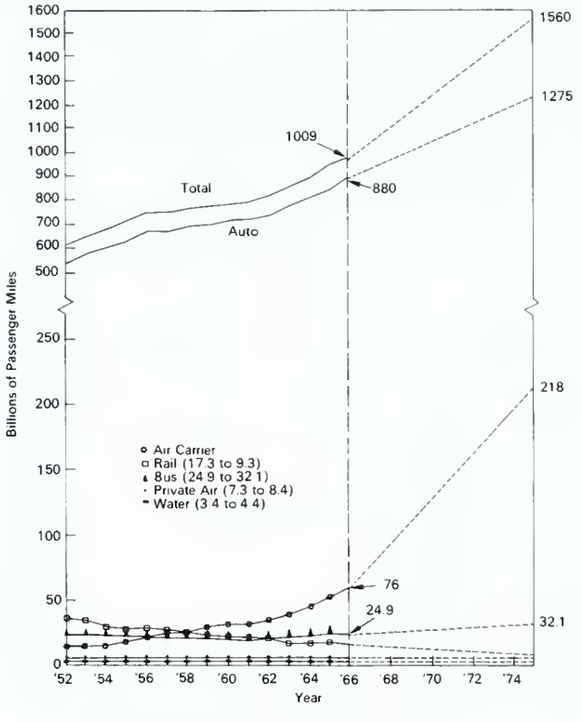


Figure 5. Comparative Employment Trends and Projections for Pennsylvania Metropolitan and Non-Metropolitan Areas: 1950-1975.

[1]Metropolitan areas include counties within the boundaries of standard metropolitan statistical areas in 1960.

[2]Includes Pennsylvania counties only.



Source: Transportation Association of America, "Intercity Passenger Miles," April, 1967.

Figure 6. Trends in Intercity Passenger Mileage in the United States to 1975.

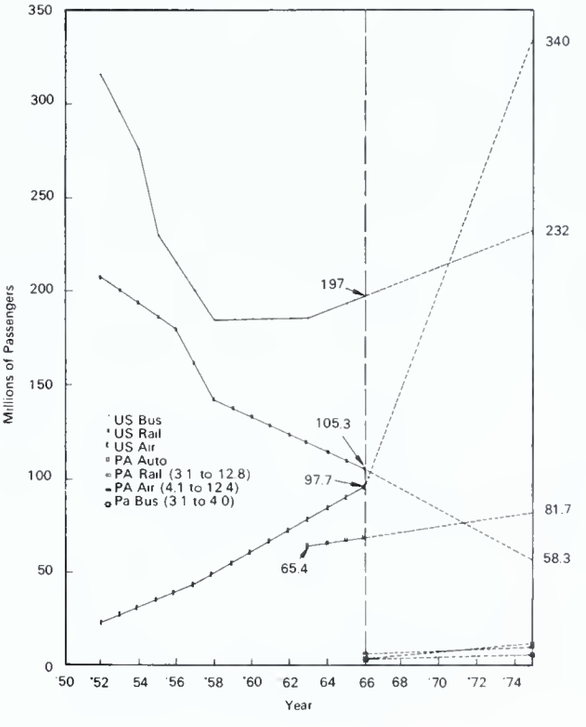


Figure 7. Trends in U. S. and Pennsylvania Intercity Passenger Traffic to 1975.

Figures 8 and 9 illustrate predicted growth in intercity freight transportation, for the U.S. and for Pennsylvania, though not on the same basis, since Pennsylvania figures are not available for ton-miles of freight. Again, the Pennsylvania figures are more speculative than the U.S. ones, especially for truck freight, and for pipelines. In general, both national and state trends are similar, though pipeline traffic is a smaller part of the total in Pennsylvania.

Speculative estimates of the modal split for intercity passenger and freight traffic, for both the U.S. and Pennsylvania, are shown in Figure 10. Here too, Pennsylvania is expected to show an increase in rail passenger traffic, while highway passenger traffic is expected to have a smaller share of the total, in opposition to national trends. The national and state freight figures are not strictly comparable because one is based on ton miles and one on tonnage, but rail and truck freight are expected to continue to have somewhat larger shares, and water, air freight, and pipelines a smaller share of the total in Pennsylvania than in the U.S. as a whole. It is clear that automobile traffic will continue to dominate passenger travel, and that railways will still be the biggest mover of freight.

Highway Traffic

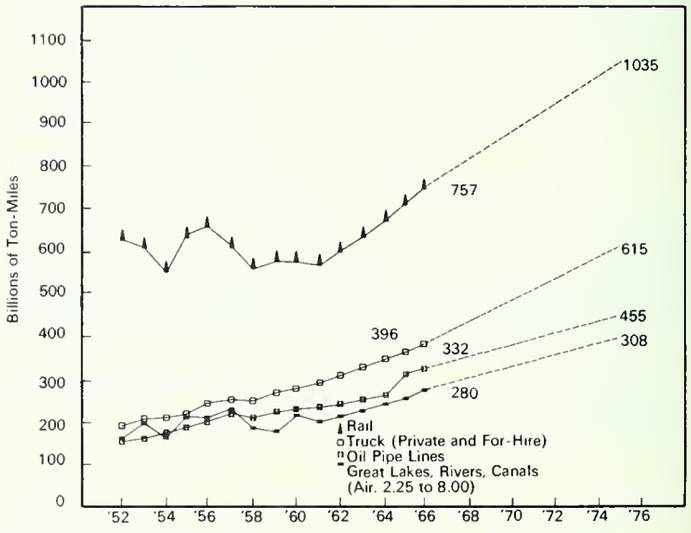
How well could our present transportation network provide the capacity required, according to these estimates, in 1975? When the predicted traffic on the highways, by automobiles, trucks and buses, is compared to the current highway network capacity as determined in the "Inventory" survey,[1] the picture is dismal in urban areas and along many traffic corridors, for the current level of highway utilization is so great that there is little extra capacity for future increases in traffic. This appears to be the most widespread short-term lack of capacity in our transportation network, one which could cause critical problems in 1975 if there is not early action. The existence of this problem is not news either to the Pennsylvania Department of Highways or to today's drivers, and the Department of Highways has been planning to cope with the projected increase in highway travel, since previous studies have produced similar predictions.

Where do we lack sufficient excess highway capacity for 1975, and how big is the discrepancy between present capacity and future needs? The answers to both these questions depend upon what quality of service we expect our highways to supply. The "Inventory" measured our present highway capacity at three levels of service, described as (1) "ideal"; (2) "desirable"; and (3) "tolerable," following techniques outlined in the "1965 Highway Capacity Manual."[2] These three levels are defined as follows:

(1) Ideal—In flat rural areas, drivers have a reasonable freedom to select speed and lane, but in mountainous rural sections or urban areas most drivers will be restricted in freedom to select speed and lane (because of curves in one case, and high traffic densities in the other), though *relatively satisfactory speeds* are maintained.

(2) Desirable—In rural flat areas, the conditions are the same as those described as "ideal" for mountainous and urban sections, while in these mountainous and urban sections, there is a possibility of *substantial decreases* in operating speed caused by fluctuations in the number of cars. Drivers have *little freedom of maneuver,* and comfort and *convenience are low.*

(3) Tolerable—Here the conditions in all areas are at the level described in the last case for mountainous and



Source: Transportation Association of America, "Intercity Freight by Modes," April, 1967.

Note: Projections generally based on trends since 1960.

Figure 8. Trends in Intercity Freight Ton-Miles in the United States to 1975.

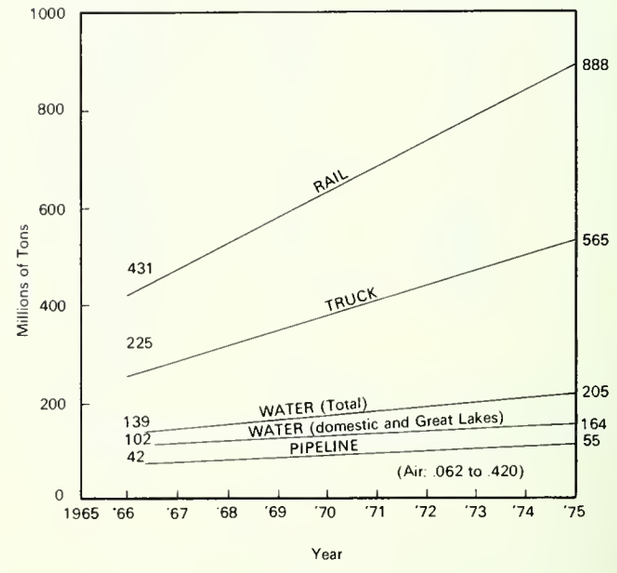


Figure 9. Trends in Pennsylvania Intercity Freight Tonnage to 1975.

[1]Project #4.

[2]Project #4, Appendix.

urban areas. This level of service is described as *"tolerable for short periods"* by the Highway Capacity Manual.

These three sets of conditions might equally well have been described as "good," "fair," and "poor," depending upon one's interpretation of the words, but while the names are relative, it is the conditions they describe which are the important points to remember.

Measured by "ideal" ("good") standards, by 1975 almost all the state's major highways will be overcrowded, and only some interstate highways will still have excess capacity. The worst crowding will be around Pittsburgh and Philadelphia, where the excess of vehicles over capacity may be as much as 20,000 per day on each of a number of roads, as shown in Figure 11.

Measured by "desirable" ("fair") standards, about one-third of the state's highways will be over-utilized in 1975, with the worst over-crowding around Philadelphia and Pittsburgh, though fewer of the roads *under this standard* will be over-utilized by as many as 20,000 vehicles per day. Figure 12 shows the future excess capacity, or lack of it for "desirable" conditions in 1975, while Figure 13 shows the needs and extra capacity when measured by "tolerable" ("poor") standards.

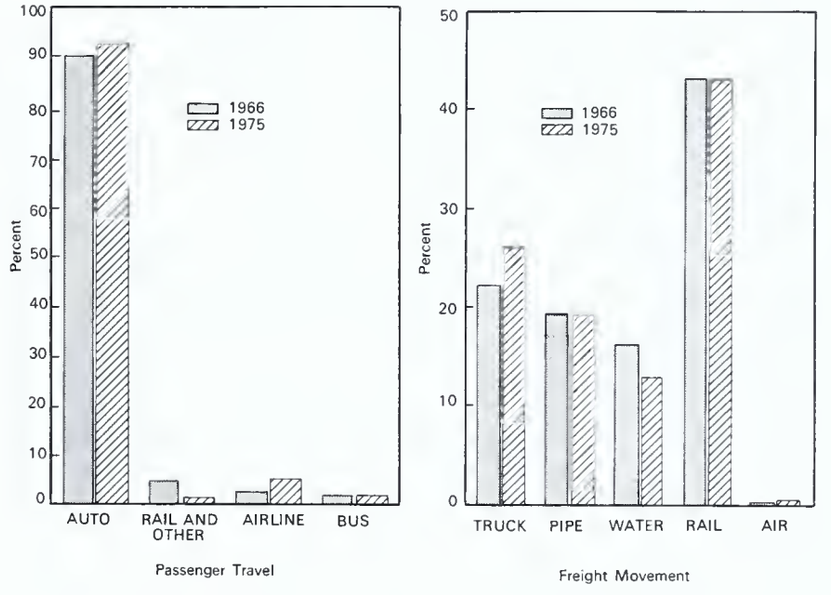


Figure 10a. Speculative 1966 and 1975 Modal Split for the United States: Passenger Traffic and Freight Tonnage.

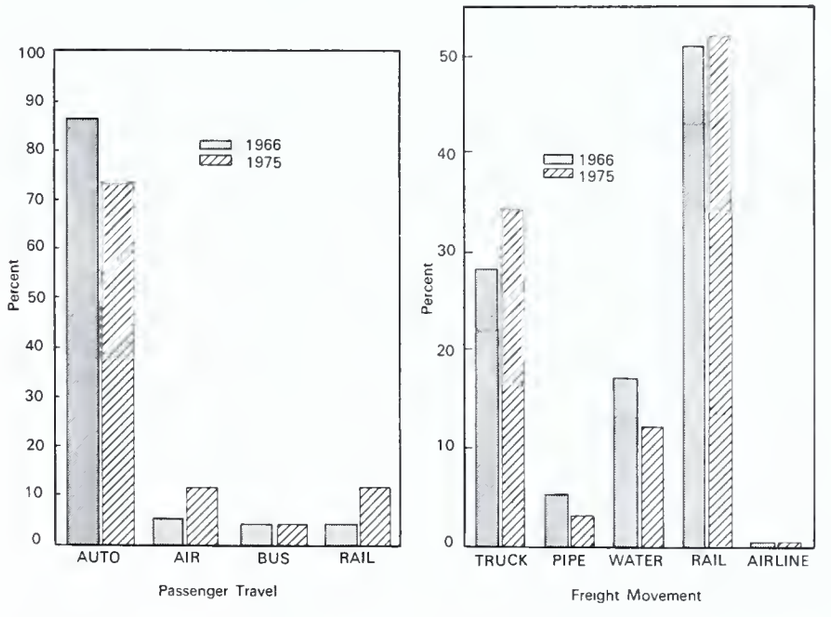


Figure 10b. Speculative 1966 and 1975 Modal Split for Pennsylvania: Passenger Traffic and Freight Tonnage.

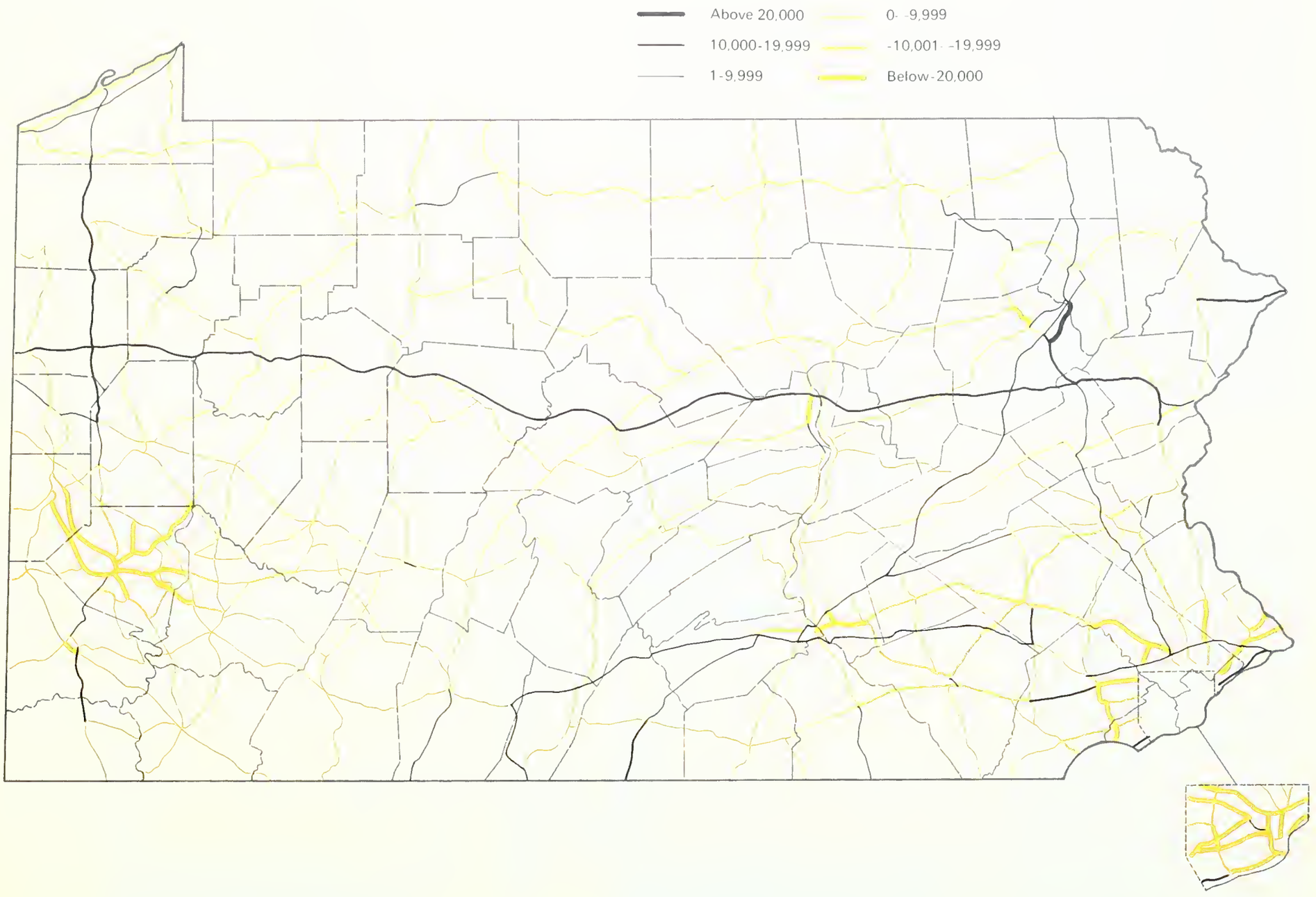


Figure 11. Additional Daily Highway Capacity Under Ideal Conditions in 1975.

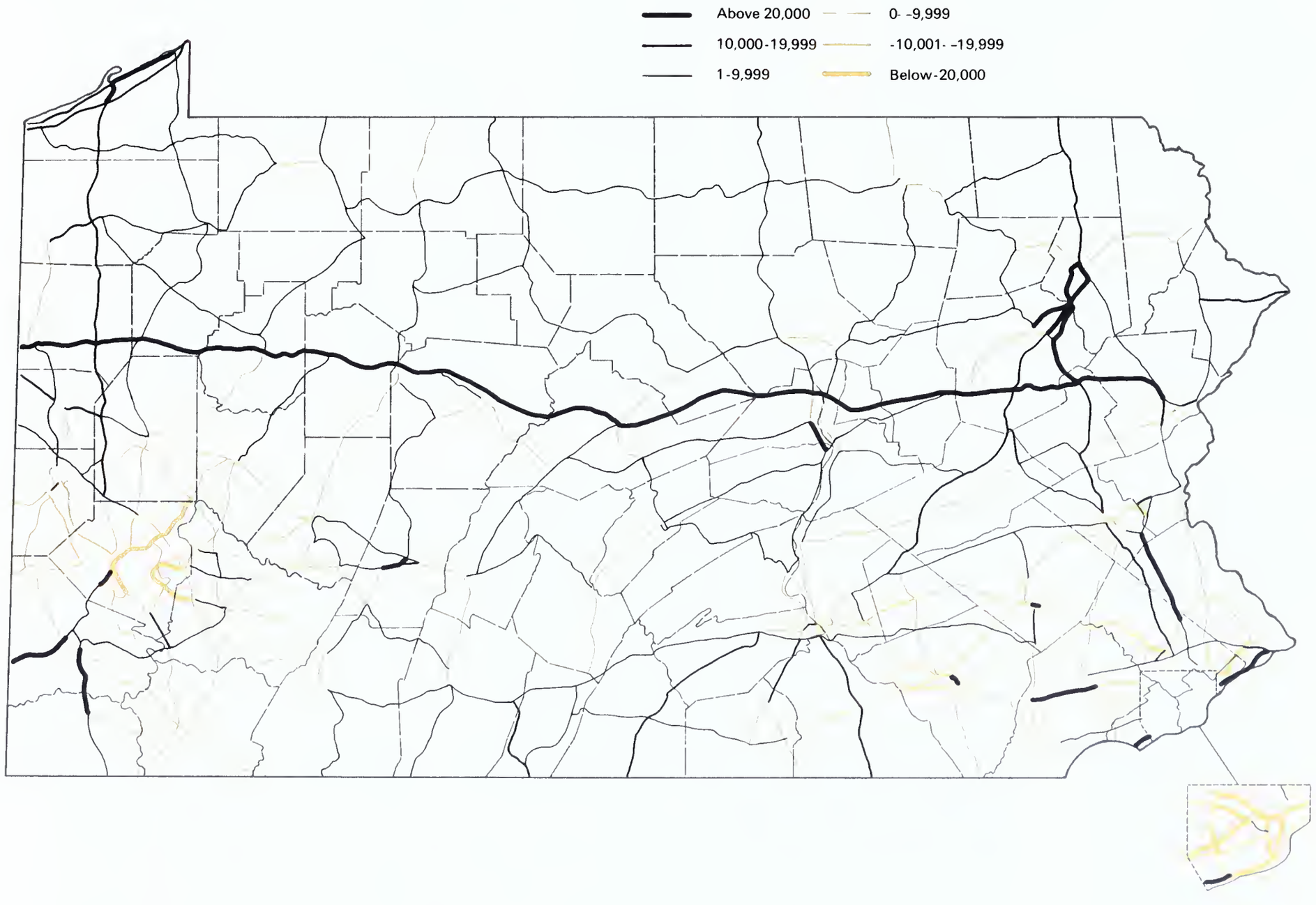


Figure 12. Additional Daily Highway Capacity Under Desirable Conditions in 1975.

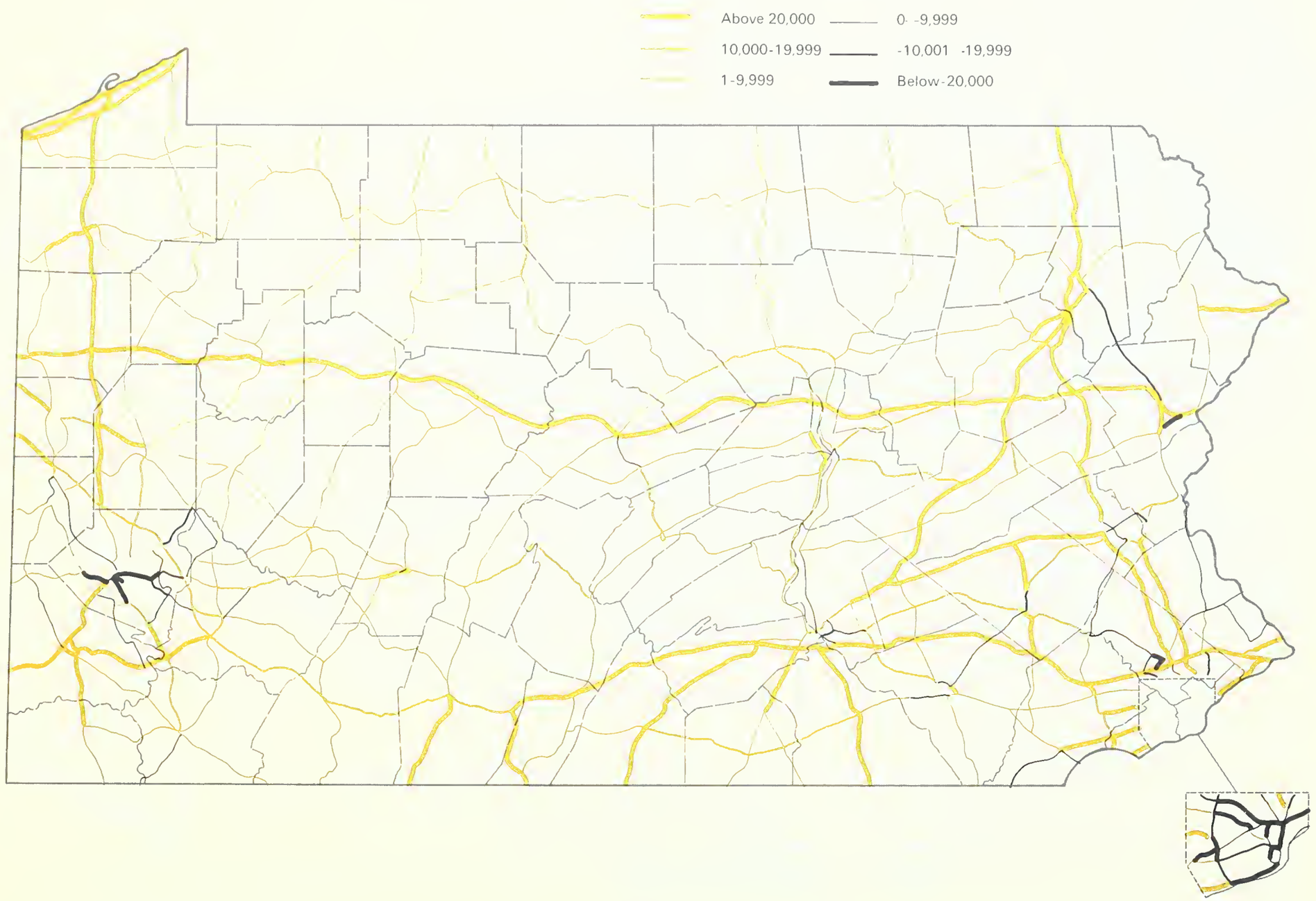


Figure 13. Additional Daily Highway Capacity Under Tolerable Conditions in 1975.

Under "tolerable" standards, most roads will still have extra capacity available in 1975, except for some of the highways around Philadelphia, Pittsburgh, and Harrisburg, and some scattered sections of highways in other parts of the state. Even under this minimum set of conditions, there are still a number of roads around Pittsburgh and Philadelphia which will be over-utilized by as many as 20,000 vehicles a day. These results are not surprising, since according to the "Inventory" survey, in the light of "ideal" standards 75% of the state's primary highway system has *no excess capacity now,* measured by "desirable" standards about 40% has no excess capacity, and by "tolerable" standards nearly 20% has no excess capacity *now.*[1]

The Department of Highways has estimated that about 5100 miles of new streets and highways will be constructed by 1975, with 2000 miles on local urban or municipal street systems, and 1600 miles as part of the state urban highway system (70% of the total in urban areas). Clearly, the urban areas represent a serious transport crisis.

Truck Traffic

The expected truck traffic in 1975 is shown in Figure 14. The predictions, like those for highway traffic in general, are based on Traffic Surveys made by the Department of Highways.

Motor freight in Pennsylvania is predicted to increase from 225 million tons in 1966 to 565 million tons in 1975.[2] This is a "do-nothing" forecast, which does not consider increases in motor freight which might be generated by accelerated economic growth in the Commonwealth, or by possible revision of regulations governing the trucking industry.

Rail Traffic

Intercity rail passenger traffic is expected to grow from 3.1 million passengers annually in 1966 to 12.8 million by 1975, largely because a 20% annual growth rate is predicted for the Northeast Corridor. In the same period, rail freight is expected to grow from 431 to 888 million tons annually.[3] The estimates of future demand were obtained from company-wide growth rates, rather than data for actual routes within Pennsylvania.

Track capacity of the major rail corridors in Pennsylvania has been determined and, although the past five years have shown a marked upturn in revenue ton-miles carried, both nationally and in Pennsylvania, even the most optimistic growth estimates would cause no serious deficiencies in capacity by 1975.[4] However, terminal facilities and equipment will be a serious problem. The major rail corridors are shown in Figure 15.

[1]Project #4, page 53.
[2]Project #5.
[3]Ibid.
[4]Project #5, pp. 78-110.

Pipeline Traffic

For pipelines carrying crude oil and petroleum products, the data was rather scanty. Information was obtained from individual companies. Pipeline traffic is expected to grow from 818,000 barrels per day in 1966 to 1,073,000 barrels per day in 1975.[1] In any case, this mode of transport is one in which the private market responds vigorously to demand, and it is unlikely that any Commonwealth action will be required in the near future. Pipelines are shown in Figure 16.

Air Traffic

Air traffic can be separated into three categories, air passenger service by scheduled airlines, air freight, and general aviation (privately owned planes), with differing amounts of information suitable for demand prediction existing for each of the three categories. Scheduled air passenger traffic has grown at a rate of 8% or 9% annually over the past ten years both in Pennsylvania and nationally, while the trend since 1962 has been higher, about 12% a year for Pennsylvania and 15% a year nationally. Scheduled aircraft operations, because of the introduction of larger planes, will not grow so rapidly, but *peaks of passenger flow* will be more drastic as the larger planes arrive and depart. Pennsylvania passenger originations are predicted to increase from 1966's 4 million to 12.4 million in 1975. Air cargo has been growing 20% a year, nationally, and 17% a year in Pennsylvania, over the last five years. It is expected to increase from 62,000 tons in 1966 to 420,000 tons. General aviation operations are expected to increase 6.9% annually in national projections for the next few years, and growth in Pennsylvania should be similar. Domestic air travel has been one of the fastest growing businesses in the nation, growing at a faster rate than overall economic activity, and Pennsylvania's growth trends are very close to national trends.[2]

At Philadelphia International Airport and Greater Pittsburgh Airport, the aircraft operations are about 60% by scheduled air carriers, but for the others the percent of scheduled aircraft operations is only from 25% down to about 5% of the total, so that general aviation is a major part of the traffic at most of the airports in the state. Besides the 16 airports having scheduled air carrier service, there are another 140 public general aviation airports, many of them marginal in their capability to handle modern aircraft, and about 300 more private airports, for corporate, experimental, or other non-public use.

Philadelphia International and Greater Pittsburgh, the two largest airports in the state, are presently planning runway expansions to provide sufficient capacity for larger aircraft and considering ways of handling the increased

[1]Project #5.
[2]Ibid.

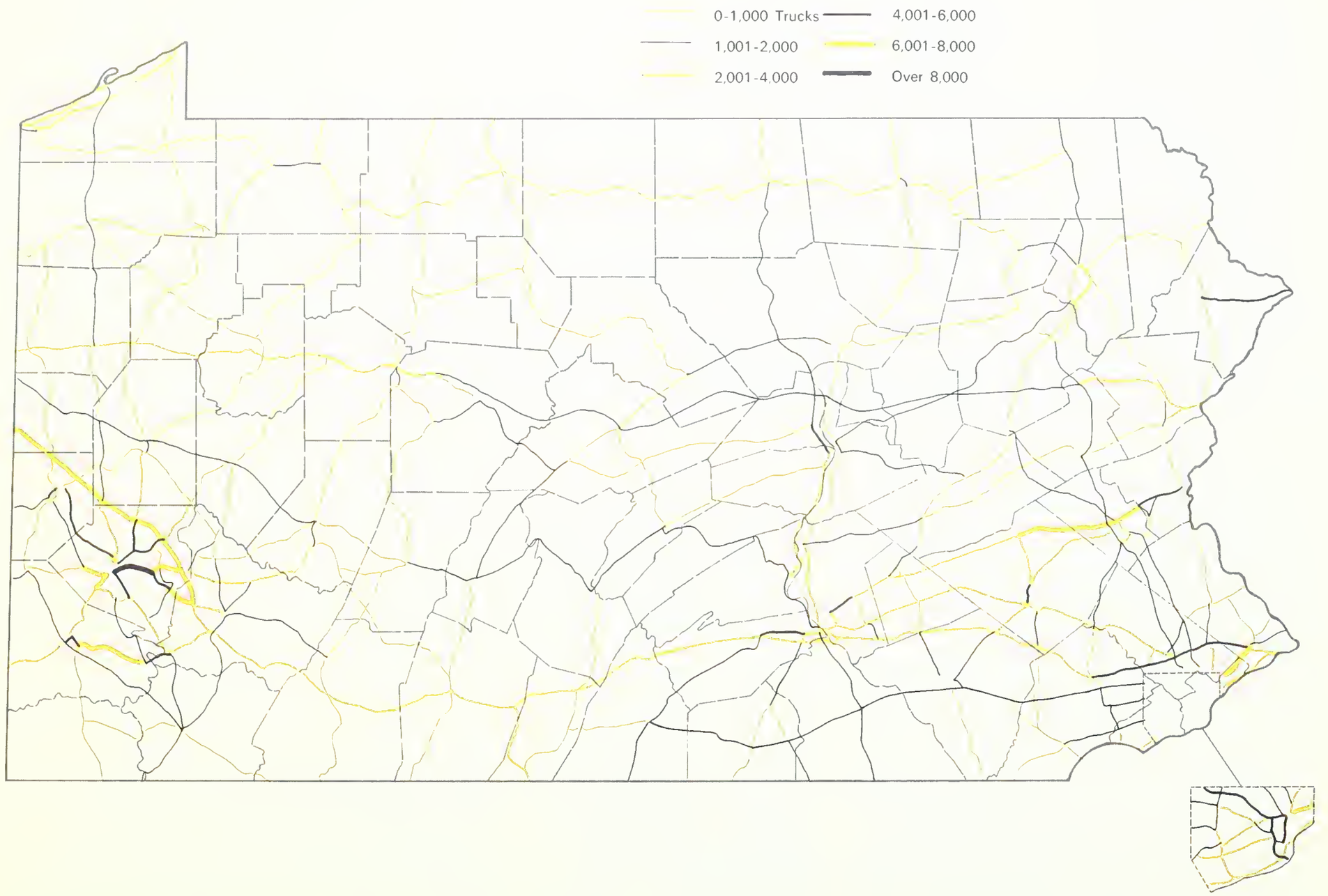


Figure 14. Average Daily Truck Travel on Major Corridor Highways in Pennsylvania in 1975.

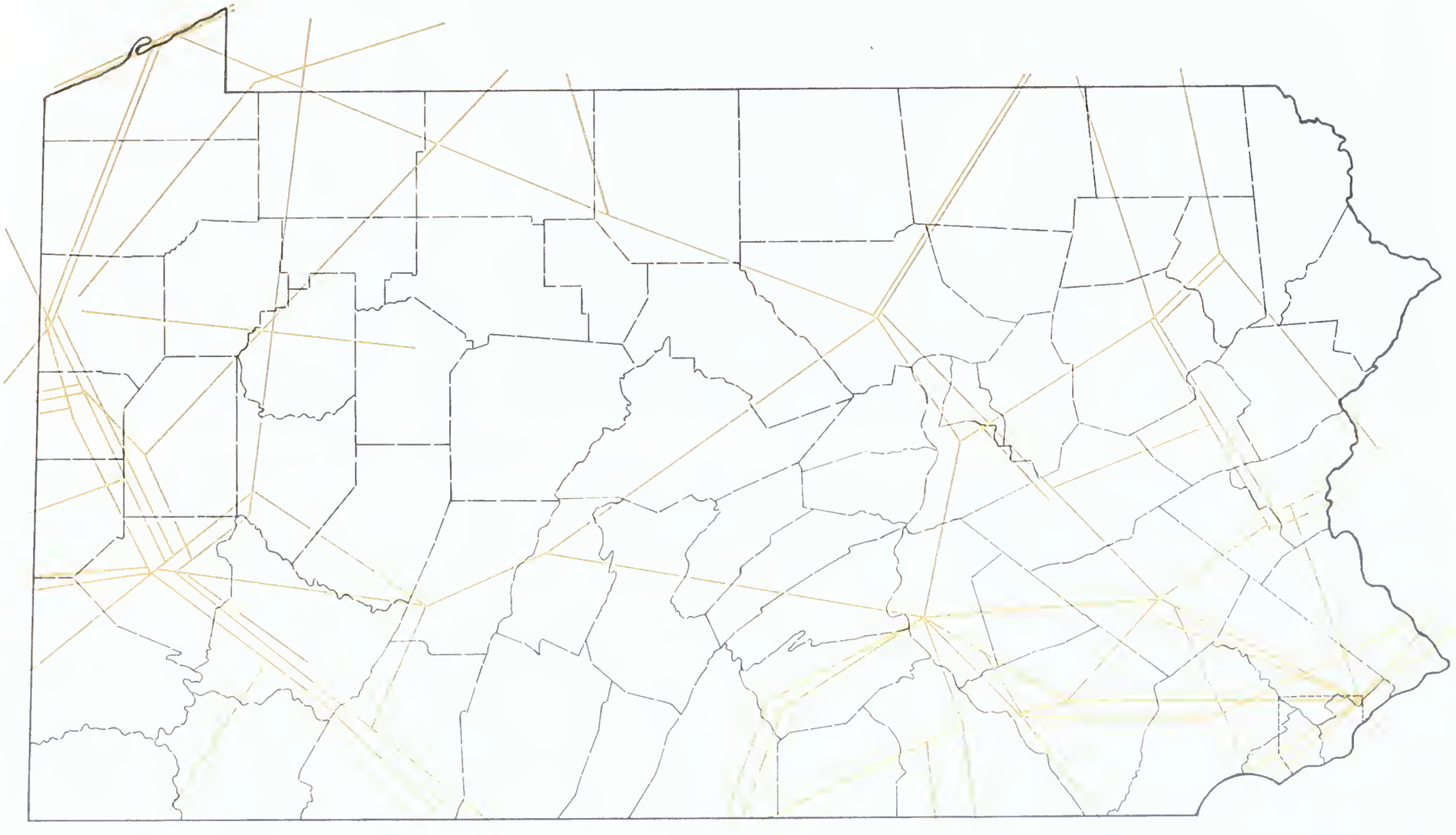


Figure 15. Major Rail Corridors in Pennsylvania in 1975.

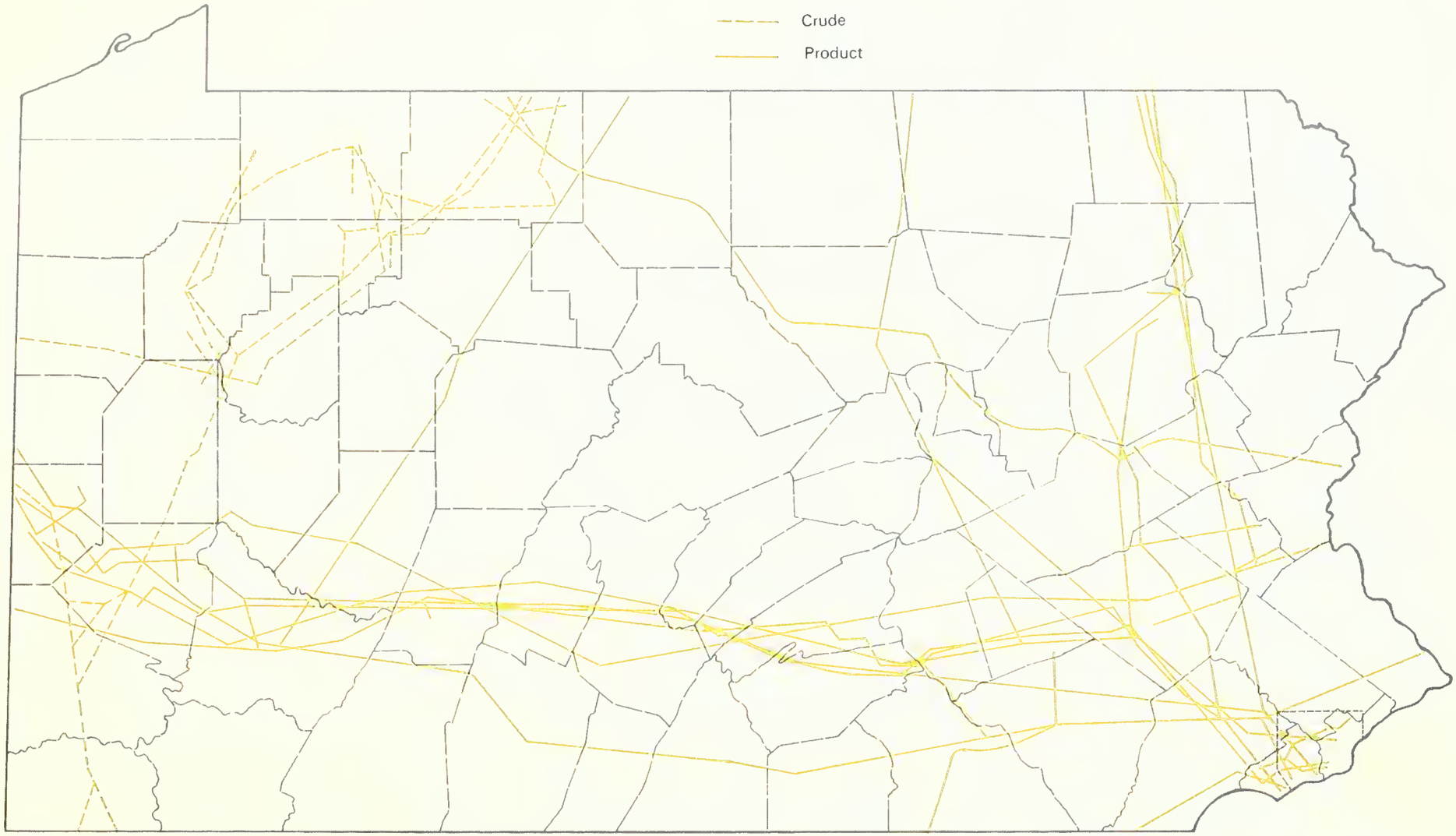


Figure 16. 1975 Pipeline Throughput in Pennsylvania.

passenger peaks which will occur when new planes able to carry several hundred passengers start flying. Eventually, policy decisions will have to be made whether to build new airports or to replace and expand facilities at the present airports. At the smaller air carrier airports capacity problems are not so critical. Runway capacity will have to be increased at some, but these improvements are already under way, and terminal capacities seem sufficient.

The expected increase in general aviation traffic at North Philadelphia and Allegheny County suggests that both will probably require additional capacity by 1975. Many other general aviation airports will face serious difficulties in adapting themselves to modern requirements, and some have no room for expansion at their present sites.

All in all, air traffic problems are tied closely to our most serious state transport problems: urban congestion, and "interface" congestion.

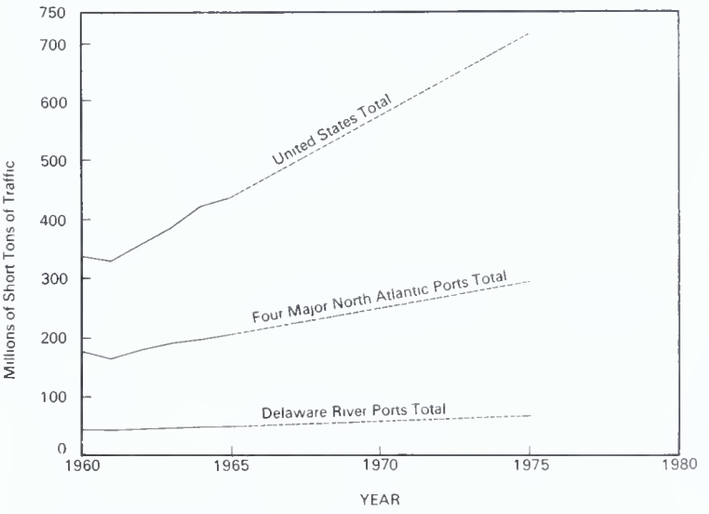
Waterway Traffic

Pennsylvania has three water transportation systems: the Delaware River Ports, the Port of Erie, and the inland waterways of Western Pennsylvania. Each of these is considered separately, but the overall conclusion is the same for all three: that existing and planned port facilities will be adequate to handle the 1975 demand predicted from recent traffic trends, although they may not be adequate for increasing, or even maintaining Pennsylvania's present share of the country's waterborne commerce. Improved capacity, on the other hand, might well attract more traffic. The Commonwealth's total waterborne freight is expected to grow from 139 million tons in 1966 to 205 million tons in 1975.[1]

There is no dearth of statistics on waterborne commerce, since much information is published by the United States Army Corps of Engineers and other agencies, including the Delaware River Port Authority.

The Delaware River Ports are second only to New York in the annual volume of commerce. The complex includes the Port of Philadelphia, Chester, Fairless, and Marcus Hook, in Pennsylvania. Pennsylvania ports handle more than 70% of the total tonnage of the whole Delaware complex, and their share is expected to increase to 80% by 1975, with the Port of Philadelphia continuing to handle almost half of the total tonnage. Total tonnage at the Delaware River ports in Pennsylvania is expected to grow from 80 million tons in 1966 to 104 million tons in 1975.[2]

The Delaware River Port complex competes for a share of U. S. foreign and domestic waterborne commerce. There is not much competition for domestic or coastal traffic because it is usually a movement of bulk commodities from a supplier to a particular industry, and is therefore tied to ports close to the supplier or industry. But the competition is stiffer for foreign commerce, especially for general cargo, i.e., non-bulk traffic, which may originate at or be destined to any part of the country. General cargo brings greater economic benefits to the port which handles it than does bulk cargo. In foreign commerce, especially general cargo traffic, the Delaware River Port complex is mainly in competition with the other major North Atlantic ports, New York, Baltimore, and Hampton Roads, and to some extent with New Orleans and the Great Lakes ports. Figure 17 shows that the Delaware River Ports have a growth trend in foreign commerce lagging behind both that for all United States ports and that for the major North Atlantic ports, although there has been an increase in tonnage because of the great growth in international trade. The declining share of total North Atlantic ports foreign trade reflects to some extent increasingly obsolescent facilities for general cargo handling at the Delaware River Port complex.



Source: Wilbur Smith and Associates,
Table 5A-4 from Foreign Commerce, Delaware River Ports 1963 through 1966

Figure 17. Comparative Trends in Port Commerce of Delaware River Ports, Four Major North Atlantic Ports and United States Totals.

The Delaware River Ports have been first among the North Atlantic ports in imports because of the huge volume of dry and liquid bulk commodity imports moving through its harbors, but it is below other North Atlantic ports in exports, where general cargo is a larger part of the total.

The general cargo handling facilities of the Delaware River Ports complex are almost entirely in the Port of Philadelphia and are in poor physical condition, with poor access for rail and motor carriers, berths too short for modern ships, and inadequate cargo handling space by modern standards. Other North Atlantic ports have had the same problems, but have carried out major modernizations of

[1]Project #5.
[2]Ibid.

cargo handling facilities while the Delaware River Ports have not yet done so. The Port of Philadelphia is building some modern marine terminals, using funds from both the City of Philadelphia and the State of Pennsylvania. Some private terminal operators are also investing large amounts in modernizing pier facilities. These existing and planned facilities are sufficient to handle expected increases in waterborne commerce, but there is a real threat to the large bulk import traffic in that the Delaware River channel depth of 40 feet is not sufficient for the new supertankers, and some of the petroleum imports now moving to the Delaware River Port complex might eventually go elsewhere.

The situation at Erie is quite different. The Port of Erie has not shared in the great increase in foreign waterborne traffic at some Great Lakes ports since the opening of the St. Lawrence Seaway to deep draft vessels. On the contrary, Erie's total waterborne commerce declined 84% between 1956 and 1966, from 6.4 million tons to 1 million tons, partly because of a decline in coal traffic. Up to 1964, coal shipments made up more than one half of Erie's waterborne commerce.[1] In 1965, after closing of the Pennsylvania Railroad's coal dock, shipments dropped to zero. (This does not reflect a complete loss to the state, since a large part of the coal shipments have been re-routed through the state by rail, as comparative rates dictated.)

In 1966 there was another major blow to the Port of Erie in the closing of a plant which used iron ore shipped in via the port. As a result there have been no iron ore movements in 1966 and 1967. Projecting the existing total traffic trend to 1975 suggests that although outgoing bulk cargo, which was formerly most of the traffic, has already dropped to nearly zero, general cargo imports have increased substantially and should continue to do so. A new general cargo terminal is being built, and there is, of course, excess capacity for handling bulk cargo. Thus the capacity of the Port of Erie to serve present and expected future traffic will be more than adequate. It is unlikely that the coal and iron ore bulk traffic will be regained unless new industries requiring them move into the area. Total freight tonnage is expected to grow from 975,000 tons in 1966 to 1.6 million tons in 1975.[2]

The Ohio and its two chief tributaries, the Allegheny and the Monongahela, are the navigable inland waterways of western Pennsylvania. The total tonnage moving on the rivers in 1966 was about 58 million tons,[3] roughly equivalent to half the total tonnage handled by the Delaware River Port complex, and is predicted to increase to 100 million tons in 1975. Coal, iron and steel, and petroleum are the largest items in the traffic. There are some 240 terminals on the three rivers inside Pennsylvania, 21 of them public.[1] As a whole, the public terminal facilities can handle any current river traffic or that anticipated in the near future, except that additional grain facilities might be needed if there should be increased movement of grain into the area. A 1958 study concluded there was not enough foreseeable new tonnage to justify the building of a new publicly owned terminal, a conclusion which still appears to be valid. The private terminals, which handle most of the traffic, are closely tied to local industries, and would presumably be expanded by private capital if the need arises.

[1]U. S. Corps of Engineers, "Waterborne Commerce of the U. S.," 1966. Part 3.
[2]Project #5.
[3]U. S. Corps of Engineers—*op cit.*

"Keystone Corridor"

The Committee also considered a report made by WABCO, entitled "Demand, Supply, and Economic Impact of Transport in the Keystone Corridor" (1967), and adopted the following resolution:

"The Keystone Corridor Report is recognized as a feasibility report, reflecting a limited scope of work, dealing with the consideration of Transport in the Keystone Corridor as a condition of urgent concern to the economic development opportunities of the State of Pennsylvania.

"The Committee feels that the Keystone Corridor concept has validity and expresses the judgment that its further study is warranted and in the best interest of the Commonwealth, with emphasis on:

"Demand analyses—including greater definition of other competitive transportation elements;

Economic impact—including particular reference to development within the Commonwealth;

Route study—further detailed studies of the general route as presented, with possible modification in location;

Railroad service—evaluation of enhanced rail service as presently provided in comparison with proposed Corridor service;

Federal interest—coordination with Federal interests as reflected in Northeast Corridor Transportation Study and other relevant studies, policies and programs of the Department of Transportation, the Department of Housing and Urban Development and as may be authorized by Congress;

State Master Plan of Transportation—coordination with over-all State policy concerning transportation, its formulation and implementation including the imperative articulation of a Statewide Master Plan of Transportation.

"It is the further judgment of the Committee that steps taken to apply the Keystone Corridor concept, including the acquisition of rights-of-way, should be predicated on the results of the foregoing efforts."

[1]Project #4.

RESULTS OF THE DEMAND SURVEY[1]

From this look at the demand survey, we can see that the trouble spots between now and 1975 will be first, on our highways system, where many links will be over-utilized before 1975; second, at some of our airports which will need to undertake major upgrading of facilities to meet the future demand; and third, at other intermodal transfer points (interface). No immediate lack of capacity is anticipated for the railroads or pipelines, and the waterways are expected to have sufficient capacity to meet the demand predicted from present trends, although (particularly on the Delaware River) action could be taken which would stimulate demand.

One facet of our transportation network which was not looked at in the survey of future demand is urban public transportation, since the demand survey was limited to inter-city transportation. However, its critical nature was plainly evident in the implications of the survey. Over-utilization, or failure of capacity, was centered on the urban areas in the highway survey. Urban transportation, and problems of transportation "interface" were keys to the air traffic survey. Urban congestion hampers truck movements, and the water-truck, water-rail, and rail-truck (piggy-back) interfaces. Clearly, information on transportation plans within urban areas will be needed for state planning, since they will affect both the local traffic on the statewide transportation network and the efficiency of service at the beginning and end of intercity trips. The proposed design for PennDOT also recommends that decisions affecting local and regional development should have the active participation of local governments.

The Demand Study also revealed several deficiencies in the information available. Some or all of these gaps will have to be filled in the course of future transportation planning in Pennsylvania.

THE INTERIM PLAN, to 1975

As we have seen, the demands upon Pennsylvania's transportation can be expected to increase greatly in the near future if current predictions of growth are realized. Renewed industrial vigor, effective use of natural resources, and success in promoting statewide development all depend on how well the transportation system anticipates and performs its supporting functions. Existing data are still inadequate for a truly comprehensive Master Plan for transportation. To bridge the gap between the present and that time in the future, perhaps five or six years away, when we can have a true Master Plan for Transportation, an Interim Plan was made for the guidance of PennDOT.[2] The Interim Plan is both a list of recommended projects, and a rough and ready methodology (although as good as any now in use), which can be used for determining priorities until the more sophisticated methodology of the long range Master Plan is ready for use. The interim methodology uses analytic techniques as far as possible with the present limited data base, but of necessity it relies on subjective judgments in some areas much more than the long range Master Plan will have to do. The Interim Plan methodology is an improvement on the making of purely subjective judgments, because it does provide an organized path for decision making.

The list of recommended projects which has been produced with this methodology is not intended to be a rigid program for the next six years. It is a preliminary list available for revision by PennDOT. When other projects are proposed for consideration, they too can be analyzed in the same way, and may perhaps turn out to have a higher priority than some projects now on the list. As the methodology of the long range Master Plan is developed, it will gradually come into use, replacing the Interim Plan methodology, but meanwhile, this is a useful method for looking at any and all proposals for action by PennDOT on a systematic basis.

The rationale of the Interim Plan is shown in Figure 18. It begins with a consideration of the overall goals for

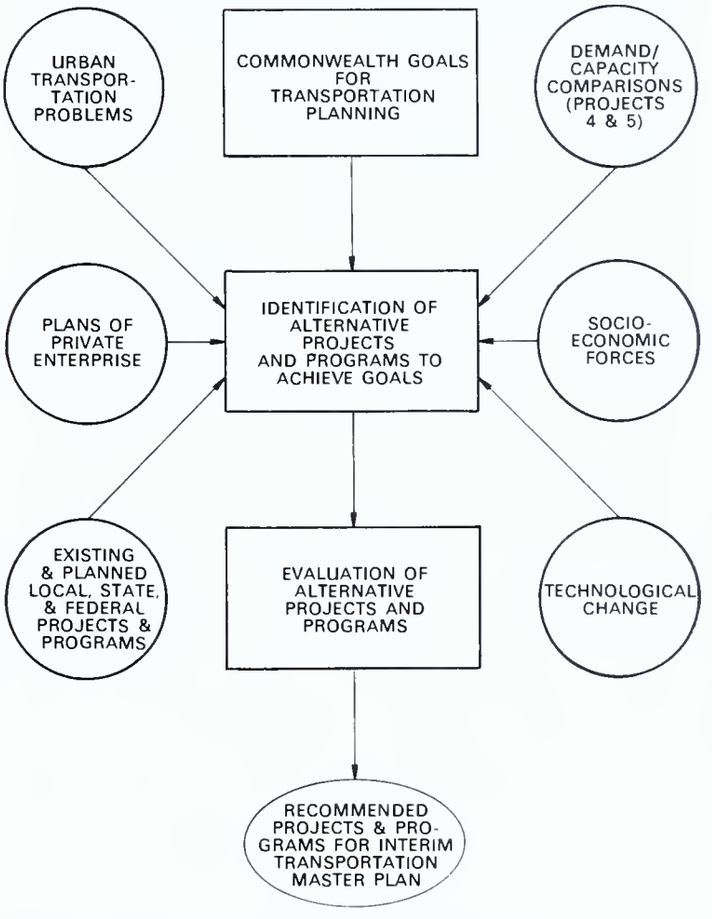

URBAN TRANSPORTATION PROBLEMS
COMMONWEALTH GOALS FOR TRANSPORTATION PLANNING
DEMAND/ CAPACITY COMPARISONS (PROJECTS 4 & 5)
PLANS OF PRIVATE ENTERPRISE
IDENTIFICATION OF ALTERNATIVE PROJECTS AND PROGRAMS TO ACHIEVE GOALS
SOCIO-ECONOMIC FORCES
EXISTING & PLANNED LOCAL, STATE, & FEDERAL PROJECTS & PROGRAMS
EVALUATION OF ALTERNATIVE PROJECTS AND PROGRAMS
TECHNOLOGICAL CHANGE
RECOMMENDED PROJECTS & PROGRAMS FOR INTERIM TRANSPORTATION MASTER PLAN

Figure 18. Rationale of the Interim Master Plan.

[1]Project #5.
[2]Project #6a.

transportation development in the state, and specifies some of the goals which have been expressed or implied by executives of State Government.

Projects and programs which would achieve those goals were located and listed. Information was systematically collected on the serious urban transportation problems of the Commonwealth; on the plans of local, state, and Federal government agencies; the plans of private enterprise; social, economic, and geographical forces affecting transportation needs; and on proposed new technology for transportation. A survey was made of proposed new technical developments to determine which ones should be evaluated by studies and demonstration projects in the period before 1975. A significant conclusion of this survey is that almost all transportation technology which will be of practical use by 1975 has already been conceived. Some of the most promising developments are recommended for study or demonstration during the period which the Interim Plan covers, and other projects are designed to provide some of the missing information on urban travel.

Seventy-nine possible programs and projects were identified (listed in Appendix I), which PennDOT might undertake in the next few years, grouped under the headings of Intercity Railway Improvements; Urban Commuting and Metropolitan Transportation; Intercity Highway Construction; Industrial Development Support; Airport Access and Facilities Improvements; Tourism and Recreation; General Development; and Administration, Legislation, and Regulation.

Some projects are interrelated, in the sense that a decision on one could change the scope of another, as for instance a decision to implement the Keystone Corridor high-speed rail link would give the proposal to promote a "land-bridge" between the Ohio River and the East Coast new significance. These related projects are evaluated independently in the drawing up of the Interim Plan, although the feasibility studies for each project would consider the interrelations between projects.

If a project had previously been studied sufficiently, an implementation cost range was assigned, and where a previous study had estimated a probable cost of implementation, that cost was also noted. When not enough was known, the estimated cost range of a feasibility study was assigned together with a speculative estimate of implementation cost. Then an estimate was made of the percent of the cost which the Commonwealth would incur in carrying out the project, based on present cost-sharing patterns for federally aided projects, and this was the figure used in the next step of the planning process, evaluating the relative merits of the projects and programs in order to select which to include in the recommended Interim Plan.

We have, then, a collection of all the pet ideas and projects ever thought about by the people and agencies of Pennsylvania who take transportation seriously. Time limits placed on the consultants meant that there are no new ideas in the Interim Plan, no break-throughs, no twenty-first century answers to today's problems. What the Plan *does* do, is to work out a strategy to keep an orderly growth going until a Master Plan can be ready—to keep our systems growing without blundering into projects which would cancel out those developed through the rational methods of the Master Plan, all without just sitting back and waiting, and doing nothing at all.

EVALUATING TRANSPORT PROJECTS

To evaluate the many possible projects, it was necessary to define the goals which transportation development should serve. No formal list of goals and priorities for Pennsylvania's future development exists at present, though a Governor's Priorities Commission for Pennsylvania is currently studying this problem. Therefore a list was made of possible goals for transportation, most of which had been stated or implied by executives of State Government, which is given in Table 2.

TABLE 2

Recommended Goals for PennDOT Transportation Planning

Transportation Service Goals

Provide sufficient capacity to meet transportation requirements when private capital or private equipment is not available to do so.

Decrease the travel time and improve the speed of transport for freight and passengers.

Improve comfort and convenience of transport for passengers and the convenience of freight movement to shippers.

Fiscal Goals

Reduce the cost and increase the efficiency of transport.

Safety Goals

Identify safety hazards related to transportation and take steps to reduce the hazards or eliminate them.

Economic Goals

Provide more employment in Pennsylvania.

Upgrade the skills and education of Pennsylvanians and increase their annual incomes.

Stabilize the economy of the state by keeping the industrial base in the state diversified; encourage development of the service industries.

Resurrect the competitive free enterprise spirit which touched off Pennsylvania's economic growth in the 19th Century.

Land-Use Goals

Add transportation facilities to provide access to open space and increase the use of recreational facilities.

Increase industrial land use in chronically depressed areas of the Commonwealth.

Social Goals

Upgrade the quality of life in Pennsylvania. Make the State a more pleasant and stimulating place to live.

Make cities more livable for people.

Clean up pollution and dispose of wastes in a socially and ecologically acceptable manner, control noise, and beautify the State.

Balance Competing Interests

Help each mode of transportation find its competitive advantages in Pennsylvania and develop them fully for the benefit of all Pennsylvanians.

Help balance the economic development among the thirteen geographical planning regions of the State developed by the State Planning Board.

These 16 possible goals could be grouped under three overall development categories:

(1) Improvements in Transportation Service
(2) Economic Development
(3) Social Development—"Making Pennsylvania a Better Place to Live"

These three categories were chosen so that three separate rankings of all the projects could be carried out, each ranking based on one of these three viewpoints of what our overall goals should be. The assumption was made that any project which ranked high from all three viewpoints would be a desirable project, no matter what combination of the three possible overall categories we might ultimately wish to use.

This method is chosen to minimize the effect of the subjective choice of goals in drawing up the Interim Plan, by giving the list of recommended projects in a form which allows policy makers to make the final subjective decision as to which of three broad areas should be emphasized. This reflects the belief that, as long as subjective judgments on goals are necessary, the subjective judgments should be made by the policy makers, not the planners, a belief also emphasized in the drawing-up of the long range Plan. The role of the planner is to provide an assessment of how each project would further the goals which the policy makers, and through them, the people, wish to emphasize.

This Interim Plan methodology does not provide a truly comprehensive analysis of the interrelations between transportation and socio-economic factors, but it does provide a mechanism for stressing these socio-economic factors in making decisions much more than has been done in the past. It was possible to use a computer to obtain a list of the projects which furthered a particular one of the three overall goals, and to rank the projects on that list in order of effectiveness in achieving the goal. The evaluation of the contribution of each proposed project to the overall goals was subjective. Most of these subjective judgments will be eliminated in the more complex methodology of the long range Master Plan, but in this relatively simple methodology it is unavoidable.

THE INTERIM PLAN

Very briefly, the major immediate construction projects in the Interim Plan (see Appendix I) are the completion of the second six-year highway improvement plan of the Department of Highways, and the improvement of accident sites and hazardous locations; the construction of scenic parkways and access roads to the Tocks Island recreation area and to primitive areas, to promote tourism; helping to buy rail cars for commuter service; constructing rail interconnections; extending certain Philadelphia subway lines; demonstrating the Skybus in the Pittsburgh area; constructing 50,000 parking spaces at the ends of transit lines; and setting up an emergency fund for the Department of Commerce to build short access roads to stimulate industrial development.

Altogether, these major immediate implementation projects account for 75% of a $2,500,000,000 budget (exclusive of the Keystone Corridor). Under present patterns of cost sharing for federally aided projects, this represents a total expenditure of over $7½ billion for transportation in Pennsylvania in the period to 1975. The Keystone Corridor represents an additional $3 billion, some part of which might be spent during this period.

Of course there is no guarantee that the Federal Government will continue to contribute the same percentage of costs in the future, or even that it would be willing to aid in the financing of all the projects which have been considered here to be eligible for federal aid. Thus the total cost to the state of implementing these first projects could be higher than $2½ billion, although a large increase is not very likely, since most of the cost is for highway projects, and the cost sharing pattern for these is a long-standing one. Both state and federal funds have already been committed for some of the implementation projects on the list, and some are underway. As these projects would become part of PennDOT's program, when and if PennDOT is established, they belong in the recommended Interim Plan.

At first glance the Interim Plan suggests that PennDOT would only be the Department of Highways under another name. Initially perhaps this would be nearly true (though a number of non-highway implementation projects in urban areas are included), because it is only the highway projects and some urban transportation projects which have already been studied and which are ready for implementation. This itself is a demonstration of the need for PennDOT. The Department of Highways and urban planning agencies are the only existing transportation planning bodies, and their plans are the only existing transportation plans. If PennDOT had been established some time ago we could now have plans for other modes of transportation ready for implementation, and a choice among alternative ways of filling our most pressing needs. However, the complete list

of feasibility studies proposed for PennDOT shows the much broader range of transportation modes which will come under the direction of the Department.

Some of the proposed feasibility studies will be completed well before 1975, and those projects which are found to be promising can then be evaluated for inclusion in the Interim Plan, with, perhaps, considerably different cost forecasts than those estimated here.

Another project not part of highway planning is the recommended study of regulatory changes affecting truckers; the development of plans to change Order 29 of the PUC, which currently prohibits truckers from negotiating among themselves to reach interline arrangements on through shipments with origin and destination in Pennsylvania. It is hoped that close working relationships may be established between PennDOT and the PUC.

This development of an Interim Plan may well be unique. Very few states have master plans for transportation of any sort, except for highways. The Master Plan developed by the New Jersey Department of Transportation is roughly equivalent to a detailed description of some of the projects in the preliminary Interim Plan presented here. The projects on the Interim Plan list which require initial feasibility studies before implementation are much broader in scope. One or two other states are developing sophisticated long-range methodologies for transportation planning, but Pennsylvania appears to be alone in developing a moderately sophisticated methodology to bridge the immediate gap in time until the complicated long-range methodology can be used.

THE LONG RANGE PLAN[1]

The long range Master Plan is intended to supersede the Interim Plan methodology in or before 1975. A Plan usually spells out the things we are going to do for the next X years. The only trouble with a Plan like that is that things keep changing as time goes on—and these days they are changing faster than ever—and pretty soon the neat Plan drawn up X years ago seems inadequate, out-of-date, and with no provision for the invention of that wonderful new Y machine.

Now imagine having a Master Plan that never got out of date! A Plan that automatically took care of new inventions, new towns and cities, new paths into Pennsylvania from bordering states, new desires and new affluence in Pennsylvania people!

That is the Master Plan proposed by the Governor's Committee. It is cheaper than two miles of super-highway. It is self-correcting. No other state in the world has one like it. And, best of all, it works.

Technically speaking, it is a "methodology" rather than a "plan." But most people will recognize it as a computer program. The Plan is a sophisticated program, with a memory bank filled with data about people, goods, industry, roads, rails, pipelines, airways, lakes, and rivers. Into the program can be fed a stream of new information about transportation needs, destinations and departures, costs and budgets—and the output of this computer program will guide policy-makers toward the best way to spend our money to provide the most efficient and desirable transportation.

The methodology places the responsibility for decisions about goals in the hands of policy makers, who will be provided with the necessary information to allow them to choose among alternative solutions those which will best further the goals they aim for. This is especially important since the results of transportation projects have important effects on many other parts of community development:—land use, location choice (both residential and industrial), distribution of employment, changes in the tax base, etc., all of which must be considered by the state's policy makers. In some instances it is no exaggeration to say that a decision on a major transportation project can determine which areas of the state will live and grow, and which may wither away.

The Master Plan is a long term one, intended to look ahead about twenty years, and all modes of transportation are considered as part of an integral balanced system. A mechanism is provided to make PennDOT's planning sensitive to other statewide plans as well. It would produce an outline solution to statewide problems, which would guide local decisions as they fill in details of place and time of implementation. To be used, it will require the collection of data to fill the glaring gaps in information. About five years will be necessary for data collection and for calibration with the data of the entire forecasting model, but parts of it will be ready for use in a shorter time.

As a first step, the planning process was broken down into a set of seven steps or tasks, and existing techniques for carrying out these tasks were reviewed, to identify the most appropriate and promising among them for our purposes:

(1) *The Identification of Policy Variables*

Ideally, perhaps, all possible variables would be taken into account, for all public decisions, not just for transportation, in one grand planning effort. In practice we are unable to do this, so we must decide which affect our transportation network most strongly, and use these factors as variable quantities. The less relevant factors must be considered as constant at some given value or acceptable level.

(2) *The Identification of Consequences or Effect Variables*

Which, of all the possible consequences of changes in our transportation network, will be relevant to the transportation policy makers when they

[1]Project #6b.

must decide among alternative plans? Direct effects, the consequences directly related to the actual usage of a transportation system from the user's and the operator's point of view, are universally accepted in current planning practice. But indirect effects—the impacts of transportation investment upon the social and economic environment—though more difficult to identify and forecast, must also be considered.

(3) *The Collection of the Necessary Information*
For most transportation studies, this is a massive, "all-at-once" undertaking, since existing data falls far short of minimum requirements. Later, it becomes a continuous process of keeping information up-to-date.

(4) *The Development of a "Forecasting Model System"*
The forecasting model system relates the effect variables chosen in step (2) to the policy variables chosen in step (1), making use of the data collected in step (3).

(5) *The Devising of Alternative Transportation Investment Strategies*

(6) *The Application of the Forecasting Model System to Estimate the Consequences of Each Alternative Strategy*

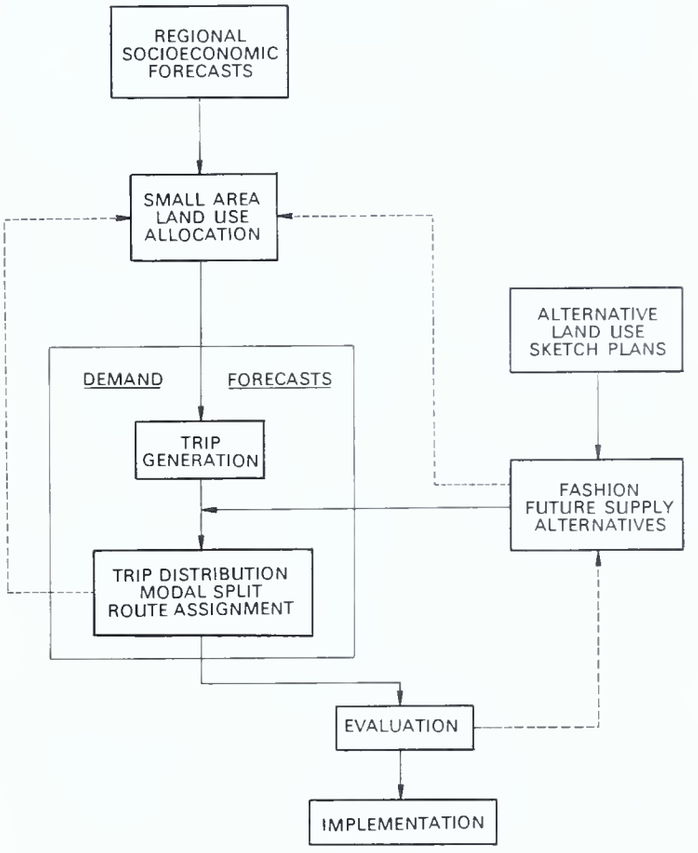
(7) *Selection of the Most Desirable Alternative Strategy*
Policy makers must decide which strategy will best serve their goals, on the basis of the information fed them by the Master Planning model system.

This definition of the planning process places the final decision and the value judgments on goals in the hands of the policy makers, and makes objective estimates of consequences easier to come by. Alternatively, as those goals can be transformed into measurable objectives, we can imagine a forecasting model system to solve for *the* unique optimum transportation system which would serve those goals best. This requires too complicated a set of mathematical relationships for present-day computers to handle, therefore the best we can do now is to propose a variety of solutions, test them with the forecasting model system to estimate their relevant effects, and choose that solution whose relevant effects best further our goals. We can produce very good solutions in this way, even if we cannot discover the unique best solution.

EVOLUTION OF PLANNING

Current transportation methodology has evolved from the many studies of metropolitan areas which have been made over the past fifteen years. These studies initially considered only direct consequences of transportation investment, but later studies include consideration of indirect consequences as well, becoming more complex in order to provide a better range of solutions to choose from. In particular they tried to incorporate some measures of the effects of transportation investment on socio-economic activity. Figure 19 shows the urban transportation planning process as it has evolved, in block diagram fashion.

At the state level, transportation planning has been confined to highways, with few exceptions. Since the early 1940's, all state highway departments have conducted periodic highway planning surveys, generally determining the physical characteristics of existing roads, and their degree of utilization. Usually, the proposed plan has been a list of individual link improvement projects, sore spots



Regional socio-economic forecasts—estimation of "control totals" for economic and demographic activity for the region

Land use allocation model—allocation of regional totals for economic and demographic activity to analysis zones within the region

Traffic generation model—estimation of total originated traffic and terminated traffic (i.e., measures of traffic outflow and inflow for each analysis zone)

Traffic distribution model—allocation of each zone's originated traffic to specific destination zones (i.e., other analysis zones and the zone under consideration) and the allocation of each zone's terminated traffic to specific origin zones

Modal split model—allocation of total O-D (origin-destination) flows to individual modes serving each given O-D pair

Traffic assignment model—allocation of mode-specific O-D flows to specific network links, superposed for all O-D pairs to obtain total link flows.

This discussion ignores the problem of multimodal journeys, but only for convenience in exposition. Some studies have considered multimodal route choice explicitly, but most have not.

Figure 19. A Simplified Picture of the Urban Transportation Planning Process.

ranked by their relative urgency, rather than a systemwide network plan. Individual projects have been reviewed in isolation as members of a list on a piece of paper, not as members of a complex network. This was the usual highway planning process during the 1940's and 1950's and many states still use it, except in their urban areas.

The development of more advanced planning methodology in urban areas emphasized the piecemeal nature of traditional state highway planning. As a result, a number of states have adopted for statewide analysis the kind of methodology which they had helped to develop for their urban areas. The key change has been the use of origin-destination surveys of existing travel patterns, which provide information allowing a state highway network to be treated as a system of interdependent links, rather than isolated segments. In the past ten years Pennsylvania and several other states have conducted "multiple screenline," origin-destination surveys, in which the drivers of vehicles crossing a series of screenlines across the state were interviewed to obtain information on trip purpose, origin and destination, and other data. With this information, it became possible to divide a state into zones, to estimate future traffic between these zones, and to allocate future demand to the links of a future highway network. Most states which have adopted this approach are applying the sort of forecasting model system typical of the earlier studies. Like those earlier planning efforts, moreover, they generally consider only a few alternative plans.

Pennsylvania is one of the states whose highway planning methodology is forward-looking. But here, as in most states, the only coherent transportation planning has been for highways, because this is the only mode in which there has been regular state investment, and therefore a recognized need for planning. The work of the Pennsylvania State Planning Board on land use and on socio-economic predictions also provides inputs of considerable help in designing a methodology for transportation planning in the Commonwealth.

In 1964 the State Highway Commission was created, and given the job of making a six-year highway system plan (the same 6-year plan included in the Interim Plan) to be updated periodically. Pennsylvania's highway planning had previously been on a year-to-year basis. The formation of the Commission also reflected a concern for the desires of the public and its pressure groups, who could express their opinions at annual hearings in each of the 11 state highway districts. Thus the Commission's recommendations could be based on local and regional needs as well as traditional engineering evaluations of projects. It appears, however, that individual projects proposed by the Commission are still being analyzed in isolation.

The Bureau of Advance Planning in the Department of Highways has recently initiated a novel regional approach patterned on urban studies, to develop eight regional plans, starting with a pilot study in a northeastern region, which includes the Scranton-Wilkes-Barre area. Planning will probably be done in terms of the existing highway grid system, with attention to rural travel and land use, and other transportation modes.

In recent years the Department of Highways has had increased contact with the State Planning Board, particularly on the matter of land use data. The Board is working on improved socio-economic forecasts for the state and developing statewide plans for objects of state investment other than transportation, as well as considering inducements for private investment. All these activities are important to PennDOT.

PennDOT'S PLANNING POTENTIAL

This is the present state of transportation planning in Pennsylvania, on which the design for a new comprehensive transportation planning methodology must be built. Great strides have been made by transportation planners in recent years, but these strides have also emphasized the need for more information. Therefore the methodological design for PennDOT must consider information development and technique development together. Planning is an investment in information procurement and analysis in order to produce better decisions. A truly comprehensive methodology will yield high-quality decisions, with lower long-term social costs caused by misjudgment. A partially comprehensive approach could lead to less-informed decisions, with more chance of mistakes, but the decisions will be reached more rapidly. Because of this opposition between quality and urgency, the design for PennDOT is fashioned in terms of a program for implementation over time, which maintains a maximum use of the information available at any given moment, from the present to that time in the future when a truly comprehensive approach is possible.

The organizational pattern proposed for PennDOT provides guidelines for overall planning. It emphasizes the need to consider all transportation modes together as a single network, and to anticipate new technologies, as well as stressing that the efforts of PennDOT must be closely related to other efforts in state development and planning. It recommends greater involvement of local agencies in transportation planning and decision-making. The Master Plan resulting from PennDOT's application of the planning model would be a "map" of links and nodes in an abstract network, which groups the real-world transportation network into a system of interconnected model "corridors." Each link and node would be described in terms of its capacity, average cost, and average travel time, for both passenger and freight service. The mapping would be for some horizon year, say 1990, but could also be used

to show the picture at any interval. This Plan would guide public investment in new transportation facilities, the most important decisions which PennDOT will face. A mechanism is provided to make PennDOT's planning sensitive to other statewide plans, by including in the forecasting model system an "econometric" model which is sensitive to induced changes in socio-economic activity. The Plan would restrict itself to the 149 zones in the state used in the Highway Department study of 1962, and for some purposes fewer and larger areas would be used. The regional analysis approach contemplated by the Bureau of Advance Planning would be used to amplify the Master Plan at the regional and local level.

If we look at the proposed methodology according to the seven planning steps listed on pages 30-31 the first step, identifying the transportation policy variables, has been carried out by specifying that the links and nodes of the Master Plan network shall be described in terms of capacity, average cost, and average travel time for both passenger and freight service.

As to the second step, defining the effect variables, a simple approach is recommended by which the desired goals are identified through planning expertise and informal dialogue with a special legislative committee. Such informal guidance is required if the number of possible alternative plans is to be kept within reasonable bounds. The direct effects to be considered are cost and travel time. (Other possible direct effects, such as reliability or convenience, are difficult to measure quantitatively and vary surprisingly little between different transportation systems.) The indirect effects to be considered are such classical measures as gross output in dollars and tons, employment by industrial sector, population, and personal income. Information on direct and indirect effects must be given both for the state as a whole and for counties, for the information of legislators and the public who will ultimately make the decisions.

For the third step, data collection, it is clear that existing figures are really inadequate, and that very substantial surveys will be required. There are glaring deficiencies in data on freight and passenger flows, in access flow patterns for all modes except highways, and in inter-industrial structure, that is, the interdependence between industries and the consequent freight flows between industries and between areas. The major need is a survey of freight flows by industries. Small-scale surveys should fill the other gaps adequately. The inter-industrial information and the econometric model which uses it will be extremely useful in other areas of state planning besides transportation, and could be very important for the economic development of the Commonwealth.

THE MASTER MODEL

Step four, the development of a forecasting model system to predict the effects of any hypothetical transportation plan, is the core of the methodological design. The proposed forecasting model system is shown diagrammatically in Figure 20, and has four major parts, the Econometric Model, the Freight Modal Split Model, the Passenger Demand Model, and the Network Simulation Model. Although each of these four models can be described completely only in mathematical terms, we can look at what each model is intended to do.

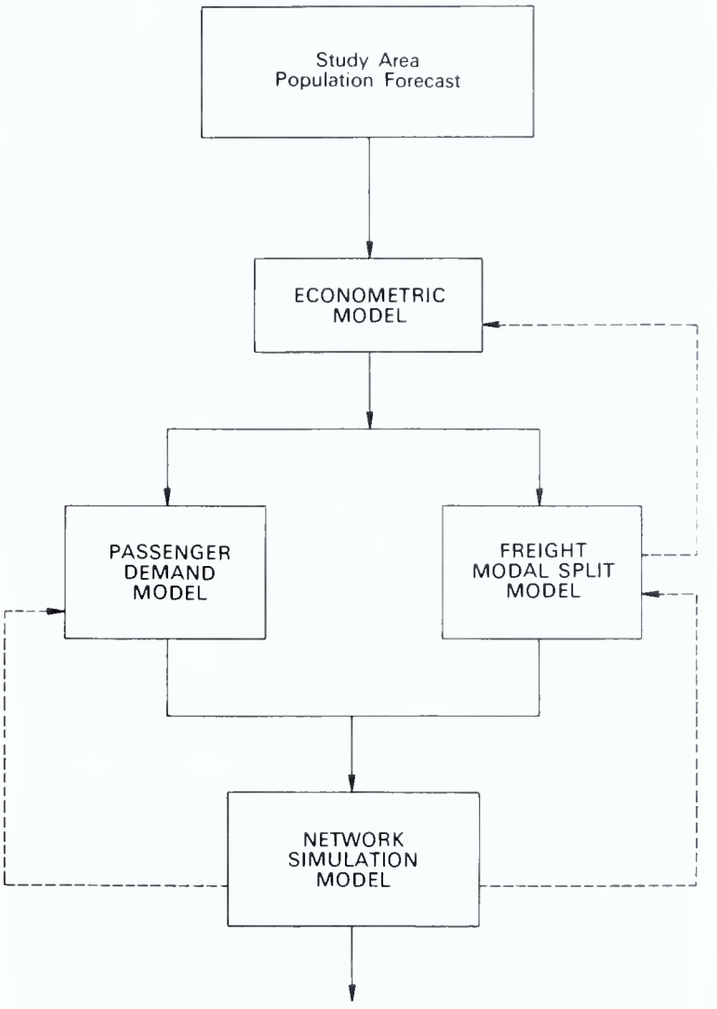


Figure 20. Outline of the Forecasting Model System for PennDOT.

The econometric model estimates the intensity and distribution of socio-economic activity for a state-wide population projection and transportation network. It predicts and estimates the indirect effects of freight commodity flows between zones in the state. It is based on the assumption that industrial activity and location are mainly sensitive to freight transportation services rather than passenger. The model is of a kind called an "input-output model," a

type that has been widely used for planning. It considers the origin and flow of commodities, including labor, to an industry, and the flow of its products to their destinations.

The next part of the problem is to predict the pattern of origin-destination flows by mode for passenger and for freight traffic separately. The econometric model has estimated the pattern of origin-destination flows of freight, so only the choice of mode remains to be predicted for freight. But for passengers, only the distribution of population and incomes have been predicted, so the passenger demand model looks at trip generation, distribution, and modal split. Freight and passengers are treated differently in the recommended forecasting model. Almost no work has been done before on freight modal splits, and no model has ever been tested on a regional scale with real data, partly because such data have never been available; so this, too, will be a new step.

An "abstract mode" approach is used, describing the various modes of transportation by their characteristics of transit time and cost. This is important because it allows new modes to be examined as well as existing ones. Using all known variables, the total number of trips between two zones by a particular mode can be predicted. Then by summing over all the available modes, the total travel between the two zones can be predicted. The process is repeated for all possible pairs of zones.

The passenger demand model predicts estimated origin-destination flows by mode for all passenger traffic and for various classes of freight commodities, between all possible pairs of zones. In the next step, the network simulation model estimates how these flows will be distributed over the transportation network as a whole. This step summarizes all the information from the previous models by predicting the patterns of route choice for each mode. In some cases, there may be only one choice, as on the waterways, while for other modes there may be a variety of choices, as on the highways. When the flows between all zones are allocated to the most logical choices of route for a particular mode, it is possible and in some cases highly probable that some of the links in the network will be overcrowded. Therefore some of the traffic flow can be reassigned to other links which still have excess capacity available. If there is no possible route with excess capacity, or if the possible routes would greatly increase travel time, then the probability is that some of the traffic would prefer to switch to another mode.

Thus there must be feedback, in terms of trip times, from the network simulation model to the two previous models which determined the modal split for passengers and freight. The modal split, with the new trip times, would be redetermined and fed into the network simulation model once more. The process would be repeated until there was no overcrowding on any of the links of the transportation network, or until the overcrowding was reduced as far as possible for that network. The result gives policy makers guidance on where to spend the taxpayers' money to achieve a workable transport system.

Almost all the previous work in this field of network simulation has been for highway traffic only. There are few precedents for simulating a multi-modal network. For other modes of transportation there is only a very simple route network within the state. It is only over a much wider area, perhaps the whole country or the eastern half of it, that a thorough analysis of route choices can be made. Therefore it was decided to limit the thorough analysis of route choice to those modes which use the highways, and to leave network analysis of other modes to the Federal Government. It was further recommended that a "package" model worked out by the federal Bureau of Public Roads should be adapted for the part of the model labelled "Network Simulation." This model could also be used to summarize the total traffic by other modes passing through a given terminal, and to evaluate the traffic in relation to capacity at a terminal. But most important is the ability of the program to accept continuous new data, since each development in a transportation program may drastically change future prospects.

STATE-WIDE PLANNING

The way in which the forecasting model system fits into the whole statewide transportation planning process is shown in Figure 21. The three remaining steps are: generating alternative transportation networks, applying the forecasting model system to them to see what their results would be, and the ultimate choice of a best plan from among the various networks proposed. The generation of alternative networks to be tried remains largely intuitive, though the existing network is a starting point. Each proposed network can be refined by the feedback of information on trip time and cost from the network simulation model to the earlier models. If the network simulation model shows that certain parts of the network will be used beyond their capacity, the results of the passenger demand and freight modal split models will also change. If the changes in modal split change shipping costs, that change will be fed back to the econometric model. With these changes introduced into the earlier models, the network simulation is repeated, and the whole process is reiterated until the values come out unchanged. These values then represent a "best" solution of the transportation problem for that proposed network based on all available information.

This proposed methodology is a tool, but it is in actuality a Master Plan—a Plan that keeps itself up to date, a Plan that can be used in new situations rather than just the one for which it was first drawn up. The ultimate value of its

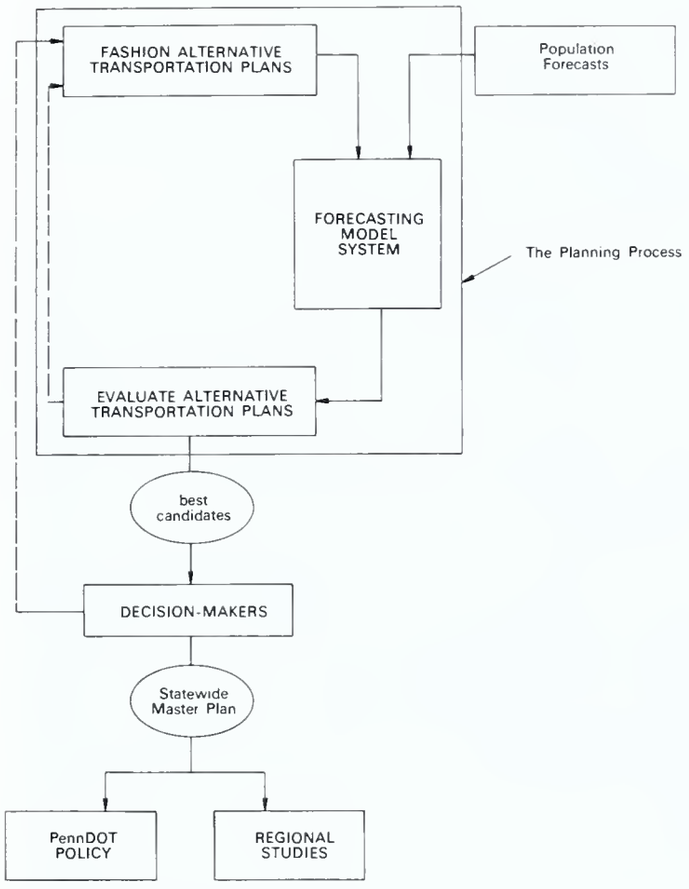


Figure 21. The Statewide Transportation Planning Process for PennDOT.

predictions will depend on the skill and experience of those who are using it. However, its innovations are not radical departures from current planning practices. They represent much-needed improvements in already tried methods, and there are enough such improvements that the result can be a forecasting method significantly better than any now in use, especially in the way in which it is sensitive to transportation policy through all its steps.

It is believed that the Plan could be completely ready for use in about five years, allowing time for data collection and the detailed working out of the model mathematics and computer programming. Thus if this methodology were to be adopted in the near future it would be completely operative by 1975, the end of the period for which the Interim Plan is designed. Furthermore, the forecasting model system has been designed to take advantage of existing planning practices in the Commonwealth and to allow a gradual blending of new methodology and old during the interim period. The network simulation model could be introduced for highway planning in 18 months, followed by the other components one at a time. Table 3 shows the stages in implementation with the estimated times and cost for preparation of each part. This staging program assumes that most of the PennDOT planning staff would come from Commonwealth personnel already engaged in some facet of state transportation planning, with the addition of six or eight professionals highly skilled in transportation and economic development planning.

The total cost for the implementation of the methodology does not represent an entirely new expenditure for planning. A part of this amount would be spent by the Department of Highways for planning in any case. Current spending of state funds for new highway projects is projected to be about $2 billion in the period to 1975. The cost of implementing the Master Plan methodology is about 3/10 of one percent of the total state funds now scheduled to be spent on new highway projects alone.

TABLE 3

Estimated program timing and Cost

Task	*Description*	*Timing (months)*	*Estimated Cost*
A	Review of methodological design	0-6	$ 70,000
B	Synthesis of existing data	3-21	200,000
C	Data Collection Design	6-18	200,000
D	Data Collection	12-33	3,000,000
E	Link Grouping Model (step in network simulation)	3-12	60,000
F	Network Simulation Model	3-7	
		24-30	80,000
G	Passenger Demand Model	18-36	100,000
H	Freight Modal Split Model	27-45	90,000
I	Econometric Model	27-48	500,000
J	System Integration	6-60	850,000
	Monitoring and Management	0-60	1,000,000
		Sub-Total	$6,150,000
	Threshold and Contingency Fund		1,000,000
		TOTAL COST	$7,150,000

If the total spending of the Department of Highways, including maintenance costs and Federal aid contributions, is considered instead, the cost of putting the methodology into operation is less than 1/10 of one percent of the total which would be spent by 1975 for highway projects alone. This scarcely seems an excessive cost for the provision of the information necessary to produce well-informed decisions on spending the other 99.9% of the money not only for highways, but whatever more may be required for other modes. This is particularly true in that careful planning will make it possible to develop efficient solutions to problems which will eventually demand much larger sums of money.

It seems self-evident, and it has been pointed out many times throughout the report, that this modest investment in planning will pay for itself a hundredfold. The cost of poor judgment, or even of good judgment based on poor information, has been demonstrated too many times in

the past; the cost of repairing a mistake may often be prohibitive, while the cost of living with a mistake may be unbearable.

A working plan makes it possible for responsible officials, and the public, to make good judgments and to use public resources to maximum effect.

CONCLUSION

Governor Shafer charged his Committee for Transportation with the job of producing a Master Plan for Transportation in Pennsylvania, and suggesting the organization of a Department of Transportation to develop that plan. A "Design For A Pennsylvania Department of Transportation—PennDOT"[1] has been presented to the governor, and a two-part strategy for transportation planning including a long range Master Plan[2] and an Interim Plan[3] for the near future has been evolved and reported here.

The Interim Plan provides a simple method to guide decisions for immediate action, and to take advantage of immediate opportunities for stimulating growth in the state. It gives a preliminary program for correcting existing deficiencies in our transportation network. The long-range Master Plan provides a complex methodology which can yield better-informed decisions in the future as gaps in our information and data are filled and the mathematical model for the planning process is developed.

Thus, the two major recommendations of the Governor's Committee for Transportation—the design for PennDOT, and a Master Plan for the guidance of Pennsylvania's planners and legislators—go hand in hand, toward the solution of one of society's most pressing problems: mobility. Programs are useless scattered among dozens of responsible agencies, few of them aware of the others' plans or needs. Thus, a PennDOT. No agency can function in the absence of accurate information or plans for action. Thus, the Master Plan.

Now is the time to take action. Shall Pennsylvania move—and move forward? Shall Pennsylvania lead—lead in its ability to satisfy the needs of its own citizens, and lead the nation in the swiftly-growing new transportation industry? It is a time of possibilities. Pennsylvania can lead. Pennsylvania can move—in fact, Pennsylvania can take a giant step forward, NOW.

[1]Project #3.
[2]Project #6b.
[3]Project #6a.

APPENDIX I

Projects Evaluated for Interim Plan[1]

DESCRIPTION		Project Cost to State (Thousand Dollars)				Total Project Cost (Thousand Dollars)			
		Study	Implementation	Total	Implementation Costs for Studies	Study	Implementation	Total	Implementation Costs for Studies
Demonstrate Electric Cars			510	510			3,000	3,000	
Subsidize Commuter Transportation	(S)	75		75	35,000	75		75	35,000
Investigate Alternative Methods of Urban Transit	(S)	550		550	51,000	550		550	300,000
Sponsor Jitney Service	(S)	35		35	510	35		35	3,000
Complete Major Highway Improvements			750,000	750,000			1,500,000	1,500,000	
Erie-Philadelphia Highway	(S)	150		150	150,000	150		150	300,000
Promote International Flights at Pittsburgh	(S)	75		75	6,250	75		75	12,500
Heliports and STOL Airports in Urban Areas	(S)	150		150	150,000	150		150	300,000
Upgrade General Aviation Facilities	(S)	150		150	37,500	150		150	75,000
Construct Roads—Tocks Island			22,300	22,300			44,600	44,600	
Construct Access Roads to Primitive Areas			6,250	6,250			12,500	12,500	
Construct Scenic Parkways			150,000	150,000			300,000	300,000	
New City Transportation	(S)	75		75	750,000	75		75	1,500,000
Change General Order 29	(S)	15		15	75	15		15	75
Keystone Corridor	(S)	300		300	3,000,000†	300		300	3,000,000†
Upgrade Rails and Equipment—Harrisburg to Philadelphia	(S)	150		150	143,000	150		150	143,000
Improve Harrisburg Terminal	(S)	150		150	2,125†	150		150	12,500†
Improve Selected Rail Stations			32	32			190	190	
Intermodal Freight Terminal at Philadelphia	(S)	75		75	17,500	75		75	35,000
Intermodal Freight Terminal at Pittsburgh	(S)	75		75	17,500	75		75	35,000
Intermodal Freight Terminal at Harrisburg	(S)	75		75	6,250	75		75	12,500
Intermodal Freight Terminal at Wilkes-Barre-Scranton	(S)	75		75	6,250	75		75	12,500
Intermodal Freight Terminal at Erie	(S)	75		75	6,250	75		75	12,500
Grade Crossing Elimination	(S)	35		35	150,000	35		35	300,000
Hovercraft on Rivers	(S)	75		75	510	75		75	3,000
Build Rail Link between Terminals—Philadelphia			8,500	8,500			50,000	50,000	
Aerial Tramway at Pittsburgh	(S)	150		150	2,125	150		150	12,500

†Maximum Cost for Mutually Exclusive Projects.

[1]Project #6a.

DESCRIPTION		Project Cost to State (Thousand Dollars)				Total Project Cost (Thousand Dollars)			
		Study	Implementation	Total	Implementation Costs for Studies	Study	Implementation	Total	Implementation Costs for Studies
Help Buy 275 Buses—Pittsburgh			272	272			1,600	1,600	
Help Buy 300 Buses—Philadelphia			298	298			1,750	1,750	
Help Buy Buses—Other Cities			145	145			850	850	
Help Buy 60 Rail Cars—Philadelphia Commuter Service			2,754	2,754			16,200	16,200	
Railroad Right-of-Way Availability—Philadelphia and Pittsburgh	(S)	300		300	51,000	300		300	300,000
Philadelphia Subway Extension			20,667	20,667			124,000	124,000	
Extend Hatboro Line			2,125	2,125			12,500	12,500	
Controversial Freeways	(S)	850		850	117,750	850		850	235,500
Liberty Tubes—Pittsburgh	(S)	75		75	2,125	75		75	12,500
Skybus Study and Demonstration—Pittsburgh		75	17,000	17,075		75	100,000	100,075	
Construct 50,000 Parking Spaces, Ends of Transit Lines			17,000	17,000			100,000	100,000	
Complete Second Six-Year Highway Program			850,000*	850,000*			1,700,000*	1,700,000*	
Improve 224 Accident Locations			7,000	7,000			14,000	14,000	
Improve 614 Hazardous Locations on School Bus Routes			25,750	25,750			51,500	51,500	
Improve 452 Hazardous Locations			22,650	22,650			45,300	45,300	
Emergency Fund—Department of Commerce			3,000	3,000			3,000	3,000	
Container Terminal at Chester	(S)	75		75	17,500	75		75	35,000
Philadelphia-Baltimore Barge Service	(S)	75		75	6,250	75		75	12,500
Pennsylvania Land Bridge	(S)	150		150	6,250	150		150	12,500
Establish Foreign Trade Zones in Pennsylvania	(S)	75		75	35,000	75		75	35,000
Survey and Enlarge Clearances	(S)	300		300	150,000	300		300	300,000
Pittsburgh Airport Access	(S)	75		75	12,750	75		75	75,000
Construct Rail Transportation to Philadelphia Airport			3,400	3,400			20,000	20,000	
Upgrade Airport Terminal Facilities	(S)	150		150	17,500	150		150	35,000
Reduce Airspace Congestion—Philadelphia and Pittsburgh	(S)	75		75	17,500	75		75	35,000
Emergency Fund—State Planning Board			300	300			300	300	
Disposal of Dredgings from Pennsylvania Waterways	(S)	75		75	6,250	75		75	12,500
Waste Pipelines	(S)	150		150	17,500	150		150	35,000
Backhauling of Garbage and Trash	(S)	150		150	1,500	150		150	3,000
Allow Multiple Bottom Trailers on Pennsylvania Highways	(S)	150		150	300	150		150	300

DESCRIPTION	Project Cost to State (Thousand Dollars)				Total Project Cost (Thousand Dollars)			
	Study	Implementation	Total	Implementation Costs for Studies	Study	Implementation	Total	Implementation Costs for Studies
Amend Constitution to Allow Pledging of State Credit (S)	35		35	150	35		35	150
Straighten Track at Philadelphia		5,950	5,950			35,000	35,000	
Build Underground Conveyor in Center City—Philadelphia		2,125	2,125			12,500	12,500	
Rail Bus Demonstration		145	145			850	850	
Purchase "Skycrane" Helicopter		850	850			5,000	5,000	
Construct 2000 Parking Spaces—Philadelphia		1,700	1,700			10,000	10,000	
Construct 2000 Parking Spaces—Pittsburgh		1,700	1,700			10,000	10,000	
Construct 4000 Parking Spaces—Other Cities		2,550	2,550			15,000	15,000	
Sponsor Helicopter Rescue Service		1,500	1,500			3,000	3,000	
Exclusive Bus Lanes (S)	150		150	150,000	150		150	300,000
Release Some State Roads to Local Government (S)	35		35	300	35		35	300
Demonstrate Electronic Merge Signals		275	275			550	550	
Demonstrate Truck Weighing Devices		275	275			550	550	
Improve General Cargo Facilities—Port of Philadelphia		1,500	1,500			3,000	3,000	
Improve Coal Loading Facilities—Port of Philadelphia		1,500	1,500			3,000	3,000	
Construct Lake Erie-Ohio River Canal		106,000	106,000			1,060,000	1,060,000	
Deepen Delaware River Channel (S)	75		75	300,000	75		75	3,000,000
Investigate Role of PennDOT in Assisting PUC/ICC (S)	35		35	150	35		35	150
Investigate Hazardous Material Movements (S)	75		75	17,500	75		75	35,000
Investigate Use of Electronic Law Enforcement Aids (S)	300		300	6,250	300		300	12,500
Reduce Air Pollution (S)	75		75	37,500	75		75	75,000
Reduce Vehicular Noise (S)	75		75	17,500	75		75	35,000
	820	126,070	126,890	529,200	820	1,158,450	1,159,270	3,457,950
All Projects	6,165	2,036,023	2,042,188	5,520,370	6,165	5,259,740	5,265,905	10,700,975

*Since some elements of the Six-Year Highway Program will be completed earlier, only the cost of the remainder of the Six-Year Program is included here.

(s)Only study of these projects is recommended for Interim Master Plan; however, estimated implementation costs are shown to indicate possible funding requirements.

DESCRIPTION		Project Cost to State (Thousand Dollars)				Total Project Cost (Thousand Dollars)			
		Study	Implementation	Total	Implementation Costs for Studies	Study	Implementation	Total	Implementation Costs for Studies
Help Buy 275 Buses—Pittsburgh			272	272			1,600	1,600	
Help Buy 300 Buses—Philadelphia			298	298			1,750	1,750	
Help Buy Buses—Other Cities			145	145			850	850	
Help Buy 60 Rail Cars—Philadelphia Commuter Service			2,754	2,754			16,200	16,200	
Railroad Right-of-Way Availability—Philadelphia and Pittsburgh	(S)	300		300	51,000	300		300	300,000
Philadelphia Subway Extension			20,667	20,667			124,000	124,000	
Extend Hatboro Line			2,125	2,125			12,500	12,500	
Controversial Freeways	(S)	850		850	117,750	850		850	235,500
Liberty Tubes—Pittsburgh	(S)	75		75	2,125	75		75	12,500
Skybus Study and Demonstration—Pittsburgh		75	17,000	17,075		75	100,000	100,075	
Construct 50,000 Parking Spaces, Ends of Transit Lines			17,000	17,000			100,000	100,000	
Complete Second Six-Year Highway Program			850,000*	850,000*			1,700,000*	1,700,000*	
Improve 224 Accident Locations			7,000	7,000			14,000	14,000	
Improve 614 Hazardous Locations on School Bus Routes			25,750	25,750			51,500	51,500	
Improve 452 Hazardous Locations			22,650	22,650			45,300	45,300	
Emergency Fund—Department of Commerce			3,000	3,000			3,000	3,000	
Container Terminal at Chester	(S)	75		75	17,500	75		75	35,000
Philadelphia-Baltimore Barge Service	(S)	75		75	6,250	75		75	12,500
Pennsylvania Land Bridge	(S)	150		150	6,250	150		150	12,500
Establish Foreign Trade Zones in Pennsylvania	(S)	75		75	35,000	75		75	35,000
Survey and Enlarge Clearances	(S)	300		300	150,000	300		300	300,000
Pittsburgh Airport Access	(S)	75		75	12,750	75		75	75,000
Construct Rail Transportation to Philadelphia Airport			3,400	3,400			20,000	20,000	
Upgrade Airport Terminal Facilities	(S)	150		150	17,500	150		150	35,000
Reduce Airspace Congestion—Philadelphia and Pittsburgh	(S)	75		75	17,500	75		75	35,000
Emergency Fund—State Planning Board			300	300			300	300	
Disposal of Dredgings from Pennsylvania Waterways	(S)	75		75	6,250	75		75	12,500
Waste Pipelines	(S)	150		150	17,500	150		150	35,000
Backhauling of Garbage and Trash	(S)	150		150	1,500	150		150	3,000
Allow Multiple Bottom Trailers on Pennsylvania Highways	(S)	150		150	300	150		150	300

DESCRIPTION	Project Cost to State (Thousand Dollars)				Total Project Cost (Thousand Dollars)			
	Study*	Implementation	Total	Implementation Costs	Study	Implementation	Total	Implementation Costs
Amend Constitution to Allow Pledging of State Credit (S)								
Straighten Track at Philadelphia								
Build Underground Conveyor in Center City—Philadelphia								
Rail Bus Demonstration								
Purchase "Skycrane" Helicopter								
Construct 2000 Parking Spaces—Philadelphia								
Construct 2000 Parking Spaces—Pittsburgh								
Construct 4000 Parking Spaces—Other Cities								
Sponsor Helicopter Rescue Service								
Exclusive Bus Lanes (S								
Release Some State Roads to Local Government (S								
Demonstrate Electronic Merge Signals								
Demonstrate Truck Weighing Devices								
Improve General Cargo Facilities—Port of Philadelphia								
Improve Coal Loading Facilities—Port of Philadelphia								
Construct Lake Erie-Ohio River Canal								
Deepen Delaware River Channel (								
Investigate Role of PennDOT in Assisting PUC/ICC								
Investigate Hazardous Material Movements								
Investigate Use of Electronic Law Enforcement Aids								
Reduce Air Pollution (S.								
Reduce Vehicular Noise (S)	75		75	17,500	75		75	35,000
	820	126,070	126,890	529,200	820	1,158,450	1,159,270	3,457,950
All Projects	6,165	2,036,023	2,042,188	5,520,370	6,165	5,259,740	5,265,905	10,700,975

CLARIFICATION
(March 20, 1969)

These last twenty-one projects are specifically excluded from the recommended Interim Master Plan for Transportation in Pennsylvania to 1975. They and the other 72 projects are listed in this table only to illustrate the short term planning methodology proposed for use by PennDOT.

The Governor's Committee for Transportation does not recommend any particular project or projects for study or implementation, with the exception of the Keystone Corridor study on page 26.

*Since some elements of the Six-Year Highway Program will be completed earlier, only the cost of the remainder of the Six-Year Program is included here.

(s)Only study of these projects is recommended for Interim Master Plan; however, estimated implementation costs are shown to indicate possible funding requirements.

APPENDIX II

Membership

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Transportation Authority*

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Carnegie-Mellon University

Mark E. Kirchner
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Advanced Helicopter Development
Vertol Division
Boeing Company

Thomas D. Larson (Dr.)
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Pennsylvania Transportation and
Traffic Safety Center
Pennsylvania State University

Robert L. Hardin, Jr.
General Manager
Transportation Marketing
United States Steel Corporation

Governor's Committee Members	*Appointees to Technical Advisory Committee*
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Ex-Officio	
Joseph W. Barr, Jr. Secretary of Community Affairs Harrisburg, Pennsylvania	Joseph J. Brady Director Bureau of Community Development* Department of Community Affairs*
Robert G. Bartlett Secretary of Highways Harrisburg, Pennsylvania	William H. Polk Special Assistant to the Deputy Secretary for Planning and Programming Department of Highways
Warner M. Depuy Secretary of Revenue Harrisburg, Pennsylvania	
Thomas G Fox (Dr.) Staff Fellow Mellon Institute Carnegie-Mellon University Pittsburgh, Pennsylvania	Thomas G Fox (Dr.)
Maurice K. Goddard (Dr.) Secretary of Forests & Waters Harrisburg, Pennsylvania	
Clifford L. Jones Secretary of Commerce Harrisburg, Pennsylvania	William C. Underwood Business Services Representative Department of Commerce
Adolph W. Schmidt Chairman* State Planning Board Harrisburg, Pennsylvania	Irving Hand Executive Director State Planning Board
William C. Sennett Attorney General Department of Justice Harrisburg, Pennsylvania	John R. Rezzolla, Jr. Deputy Attorney General Chief Counsel Department of Highways

The following were originally members of the above committees and have since resigned therefrom:

Lewis H. Warheit	R. Otto Amann Edward H. Hunnicutt David C. Sims Loren Swensen

*Asterisk indicates title or affiliation at time of appointment.

Interdepartmental Committee

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Secretary
Department of Highways

Joseph W. Barr, Jr.
Secretary
Department of Community Affairs

George I. Bloom
Chairman
Pennsylvania Public Utility Commission

Warner M. Depuy
Secretary
Department of Revenue

Herbert Fineman
House Minority Leader*

Maurice K. Goddard (Dr.)
Secretary
Department of Forests and Waters

Irving Hand
Executive Director
State Planning Board

B. Anton Hess
Deputy Superintendent and Commissioner
for Basic Education
Department of Public Instruction

Clifford L. Jones
Secretary
Department of Commerce

John R. Rezzolla, Jr.
Chief Legal Counsel
Department of Highways

General Thomas R. White, Jr.
The Adjutant General*
Department of Military Affairs

*Asterisk indicates title or affiliation at time of appointment.

APPENDIX III

Consultants Employed On Projects

Franklin Institute Research Laboratories
20th Street and Benjamin Franklin Parkway
Philadelphia, Pennsylvania 19103

Institute of Public Administration
55 West 44th Street
New York, New York 10036

Pennsylvania Transportation and Traffic Safety Center
Pennsylvania State University
University Park, Pennsylvania 16804

Transportation Research Institute
Carnegie-Mellon University
Schenley Park
Pittsburgh, Pennsylvania 15213

Wilbur Smith and Associates
155 Whitney Avenue
New Haven, Connecticut 06504

APPENDIX IV

Reports Prepared at the Direction of the Governor's Committee for Transportation

An Annotated Survey of the Literature Pertinent to Transportation—Project #2

PennDOT, Design for a Pennsylvania Department of Transportation—Projects #3 and #7

Inventory and Adequacy of Existing State-Wide Transportation Systems, Commonwealth of Pennsylvania—Project #4

Preliminary Analyses of Intercity Transportation Demand in Pennsylvania to 1975—Project #5

Preliminary Analyses of Needs and Projects for an Interim Master Plan for Transportation in Pennsylvania—Project #6a

Methodological Framework for Comprehensive Transportation Planning [Long Range]—Project #6b

Transportation and Pennsylvania's Future: Summary Report of the Governor's Committee For Transportation—written by Dr. Elizabeth Toor, Dr. Denton Beal, and Mr. Joseph S. Drake.

Commonwealth of Pennsylvania
GOVERNOR'S COMMITTEE FOR TRANSPORTATION
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